THE

DOMESTIC ENCYCLOPEDIA;

OR

A DICTIONARY

OF

FACTS AND USEFUL KNOWLEDGE,

CHIEFLY APPLICABLE TO

RURAL & DOMESTIC ECONOMY.

WITH

AN APPENDIX,

CONTAINING

Additions in Domestic Medicine, and the Veterinary and Culinary Arts.

THE WHOLE

ILLUSTRATED WITH NUMEROUS ENGRAVINGS AND CUTS

IN THREE VOLUMES.

VOL. I.

By A. F. M. Willich, M. D.

AUTHOR OF THE LECTURES ON DIET AND REGIMEN, ETC.

SECOND AMERICAN EDITION, WITH ADDITIONS,

By Thomas Cooper, Esq. M. D.

PROFESSOR OF CHEMISTRY AND MINERALOGY.

PHILADELPHIA:

PRINTED AND PUBLISHED BY ABRAHAM SMALL,

No 165, Chesnut Street,

Nearly opposite to the United States Bank.

1821.

Eastern District of Pennsylvania, to wit:

BE IT REMEMBERED, *That on the first day of January, in the forty-fifth year of the Independence of the United States of America, A. D 1821, Abraham* [SEAL.] *Small, of the said district, hath deposited in this office the title of a book, the right whereof he claims as proprietor, in the words following, to wit:*

"The Domestic Encyclopedia: or a Dictionary of Facts and Useful Knowledge Chiefly applicable to Rural and Domestic Economy With an Appendix, containing Additions in Domestic Medicine, and the Veterinary and Culinary Arts. The whole illustrated with numerous Engravings and Cuts. In three volumes. By A F M Willich, M D Author of the Lectures on Diet and Regimen, &c Second American Edition, with Additions, by Thomas Cooper, Esq. M. D. Professor of Chemistry and Mineralogy."

In conformity to the act of the congress of the United States, intituled "An act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned." And also to the act, entitled, "An act supplementary to an act, entitled 'An act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D CALDWELL,
Clerk of the Eastern District of Pennsylvania

PREFACE, BY THE AUTHOR.

AS the nature and practical tendency of the Domestic Encyclopedia have, in some measure, been anticipated, partly in the prefixed title page, a few remarks on the *origin* and *composition* of this Work, will suffice to convince the reader that it has not been undertaken with a view merely to increase the number of voluminous works already extant, and of a similar complexion.

It has been generally supposed, that the rapid succession of Cyclopedias, and Encyclopedias, which have appeared within the last twenty years, and which often are more distinguished by their alluring title-pages, than by their intrinsic merit, affords so many proofs of the progress of Science and Literature, as well as of the increasing spirit of enquiry. This conjecture, however, is extremely doubtful, if not totally unfounded.

When it is considered, that the Editors of these bulky Compilations have directed their chief attention to the *quantity* of materials, rather than to a critical selection of *facts;* that, with a few exceptions, such works have been conducted by persons better qualified to superintend a printing-office, or a bookseller's shop, than to arrange or explain the immense circle of the

Sciences; and that the *auri sacra fames* has almost uniformly been the principal object of these Speculators, it will then be readily allowed that *their* productions afford only negative advantages to the social world.

Farther, the plurality of readers have conceived an opinion, that, by the possession of an Encyclopedia, or what is pre-eminently termed, "A Dictionary of the Arts and Sciences," their library, however deficient, at length becomes complete. But those who are only, in a slight degree, acquainted with the gradual, though daily, advancement both of the abstruse and practical Sciences, will not be disposed to harbour a notion alike contracted, and fraught with consequences highly detrimental to the acquisition of knowledge. Nay, it may with equal truth be asserted, that the *earlier* impressions of books, which have progressively received additions and improvements, will answer the purpose as well as the latest publications; because they are comparatively cheaper, and fill a similar space on the shelves. Such arguments may satisfy the Antiquarian Collector, but they are inconsistent with the conviction of intelligent minds.

On the other hand, it cannot be denied, that many attempts have been made to supply the public with works professedly commenced on a more economical plan, by abridging the labours of others. Without presuming to decide on their merits, we shall quote a passage occurring in the Preface to the illustrious JOHNSON's Dictionary, when he compressed his bulky folios, or quartos, into an octavo form: "For these purposes (says that energetic writer), many dictionaries have been written by different authors, and with different

degrees of skill; but, none of them have yet fallen into my hands, by which even the lowest expectations could be satisfied. Some of their authors wanted industry, and others literature: some knew not their own defects, and others were too idle to supply them."

In regard to the *composition*, and arrangement of the DOMESTIC ENCYCLOPEDIA, many circumstances might be pleaded, by way of apology, for occasional inaccuracies and omissions; but in a work, consisting chiefly of practical information, and containing, perhaps, a greater number of *useful facts* than have ever appeared in the compass of four moderate volumes, it is to be hoped, the discreet reader will naturally be inclined to qualify his strictures, by a large share of candour and impartiality. Conformably to his original plan, the Editor has spared no pains, trouble, or expense, to render this *Economical Dictionary* as complete as the present advancement of Agriculture, Gardening, of the Familiar Arts and Manufactures, as well as the imperfect state of Medical Science, would respectively admit. Many subjects, indeed, might have been extended to greater length, and others considerably abridged, had these volumes been peculiarly calculated for the use of either town or country readers. Such, however, was not his design, as the Work now submitted to the Public, includes almost every object, more or less connected with Rural, Domestic, and Animal Economy. Hence, the inquisitive reader will find numerous experiments related, many hundreds of which have not hitherto been published in the English language.

To facilitate the mode of consulting this Work, a Table of Contents, including a reference to the corresponding synonyms, or inversions of terms, has been

prefixed to each volume; though a few provincial or vernacular names, which are now obsolete, have purposely been omitted, in order to avoid unnecessary repetition.

It will not, however, be expected that the Editor should be responsible for the accuracy of the result of those Experiments, which he has faithfully reported on the authority of others, whose names have been quoted on almost every occasion; but, in various instances where no vouchers have been adduced, the facts are either self-evident, or the account of the subject is given with a degree of diffidence, to induce attentive readers to farther investigation.

PREFACE TO THE PRESENT EDITION.

ABOUT twenty years ago, Dr. WILLICH projected and published an ENCYCLOPEDIA in a moderate compass, intended chiefly as a book of consultation on subjects connected with domestic economy, the domestic arts, and agriculture. The plan was undoubtedly interesting, and promised to be popular, had it been well conducted: but having perused it with great care, I have no hesitation in saying that the best page was the title page.

An American edition of this work was published in five octavo volumes, edited by Dr. MEASE, who added much useful matter, but struck out no part of Dr. WILLICH's labours. This edition being sold, and

another called for, Mr. SMALL, the owner and publisher of Dr. MEASE's edition, applied to me to superintend a new one. The object was, to print a corrected and improved edition in three volumes instead of five, and to reduce it in size and in price so as to make it an useful and a saleable work in the present circumstances of the public demand.

For this purpose, and with this view before me, I have proceeded to manufacture the present edition; endeavouring to make it, not indeed the best book of the kind that according to my notions might have been compiled, but the best book which, under all the circumstances, the public could afford to buy, and the publisher to sell; and I verily believe that under this aspect of the present publication, the purchaser will have no reasonable cause of complaint.

I would most willingly have struck out of Dr. WILLICH's book, every article on medicine and disease, as affording no knowledge to the educated physician, and only calculated to make common readers quacks. But I did not dare to strike out so much as this plan would have required, and still call the work a new edition of Dr. WILLICH's Encyclopedia. I have therefore contented myself with correcting manifest errors, and making those articles less objectionable than I found them.

I have retained the greater part of Dr. MEASE's additions, which certainly gave a value to the work which it did not deserve when it came from the hands of Dr. WILLICH.

I have also struck out the botanical account and description of many vegetables, that appear to me little better than weeds to be extirpated wherever we find them.

I have incorporated in this edition, almost the whole of Mr. KENDALL's excellent miniature Encyclopædia; and a great part of the compendium of Useful Knowledge by Mr. W. BINGLEY. My own additions to the articles are also very numerous.

For the purpose of making this book answer still more perfectly to its title, I have compiled expressly for this work, a Treatise on Veterinary Medicine, on Domestic Medicine, and on Cookery. The latter is chiefly taken from a very popular work entitled Domestic Cookery, not without many additions of my own, which I trust will be found improvements.

Much expense has also been incurred in additional plates, illustrative of the subjects treated in this edition: so that, although the number of volumes has been reduced, the quantity of matter contained in them is not only more than the five volumes of the former edition comprised, but it is of a description far more expensive to the publisher.

It is manifest, that a work of this kind will not admit of much detailed information, or of articles laboured into treatises. But as a book of reference to obtain the meaning of terms, and a faithful though brief description of an uncommon number of interesting objects and useful facts, I trust it will be found fully equal to the expectations which the Prospectus was calculated to raise. With this persuasion, I trust it to the public.

THOMAS COOPER, M. D.

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☞ *The corresponding synonyms, or inversions of terms, occurring in the first volume, are marked in italics in the following table.*

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THE

DOMESTIC ENCYCLOPEDIA.

A is the first letter of the alphabet in every known language, except that of Ethiopia; its Greek name is Alpha, from the Hebrew Aleph, which is very significant, denoting either an ox or a leader; each a mark of excellence or priority. The first place is deservedly given to this letter on account of its simplicity, and the ease with which it is pronounced; the first sound uttered by human creatures in their most infantile state, being that by which this letter is expressed.

In the English language, this letter has four different sounds. The broad sound, as in all, wall. The open, as in father, rather. The slender or close, which is the peculiar *a* of the English, exemplified in place, face, &c. And the short sound, of which we have instances in hat, cat, fat.

In numerals A denoted 500, and A̅ 5,000. In the Italian calendar, A, is the first of the seven dominical letters.

A, as a word, has the following significations: A, an article set before nouns of the singular number; a man, a tree. Before a word beginning with a vowel, it is written *an*; as, an ox, an egg.

A, in abbreviation, stands for artium, or arts; as, A. M artium magister; or anno; as A. D. anno domini.

In medical prescriptions, this letter with a dash above it, ā, is used for ana, "of each."

In music A is the nominal of the sixth note in the diatonic scale: it is also the name of one of the two natural moods.

ABACUS, in architecture, the superior member of the capital, to which it serves as a kind of crown. It was originally intended to represent a square tile laid over a basket; and it still retains its original form in the Tuscan, Doric, and Ionic orders; but in the Corinthian and Composite, its four sides or faces are arched inwards, having some ornament, as a rose or other flower, in the middle.

ABBE', a French word, literally meaning an *abbot*. The abbots of France, however, were divided into two classes; and these became so totally different from each other, that the character generally spoken of under the name of abbé, has long ceased to be of any official nature. Its origin must be dated about the middle of the seventeenth century; and, from its institution, which will be seen by referring to the article ABBOT, it is plain, that it was not at first, what it latterly has been, a perfectly empty title. Of the modern abbé, in the confined acceptation of the term, to which the present definition is restricted, it is not easy to give a precise account. It is a nominal abbotship which neither imposes duty, nor conveys emolument, but is valuable on account of the respect in which it is held by society, and the consequent assistance that it affords to advancement in church or state. In short, it is a station in which a man of liberal education and little wealth waits, as it were, for the favours of fortune.

ABBESS, in catholic countries the superior of an abbey of nuns, or of a community or chapter of canonesses. An abbess was formerly elected by her community, but latterly, with scarcely

any other exceptions than those of St. Clare, they have been in the royal gift. To preserve, however, an appearance of the ancient freedom of choice, the pope's bull, by which they are severally confirmed in their offices, states, that they have been recommended by a letter from their king, and approved of by a majority of the nuns. An abbess exercises all the functions of an abbot, with the exception of those which appertain to his priesthood.

ABBEY. The abbeys of England, as those of Westminster and Bath, are churches which formerly belonged to such houses of monks or nuns as were governed by an abbot or abbess. At present, an abbey is, in general, the cathedral or episcopal church of the see or diocese in which it stands; and on that account retains the more ancient and solemn, but expensive, forms of divine worship. The abbey at Westminster still possesses this distinguishing feature, as a *collegiate* church; and the church of Saint Paul, is the cathedral of the diocese of London.

ABBOT signifies FATHER, and is a corruption of AB; which, in the Hebrew, imports, first, a natural father; and, secondly, by figure, a person to whom filial reverence is due It is easy to perceive, that the custom of calling superiors "fathers," has descended from those early ages of the Jews in which the government of each family was held by its patriarch or parent; but it is somewhat remarkable, that it should have obtained general use among Christians, whom Jesus, alluding to the arrogance with which the Jewish doctors assumed the title, enjoined to call no one on earth their father; because they have but one father, who is in Heaven 'Father,' however, notwithstanding this command, is the distinction by which the monks, priests, and bishops of the Roman church have always been addressed. From *ab*, *abba*, *baba*, or *papa* (grand or pre eminent father,) is derived the French *pape*, and the English *pope*, the chief of the church; and abba, which makes *abbe* in the French, the superior of a monastery. An abbot was, originally, a plain monk, to whom the care of his monastery was committed. He lived like the other monks, except that he had a separate table for the reception of guests, a duty which was one of the prominent motives for the foundation of monasteries. An abbot has a jurisdiction over priories, and is consequently of higher rank than a prior. He has three sorts of authority: the first consists in the maintenance of order among the monks, in the repair of the building, and the management of its estates; the second, in regulating divine service, in receiving the vows of those who enter into the society, giving the tonsure, and bestowing the benefices or livings that are in the gift of the monastery; the third, in correcting, excommunicating, and suspending offenders. It was because certain abbots and priors in England, in right of their monasteries, held lands of the crown, for which they owed military service, that they obtained the title of LORDS, and were summoned, as barons, to parliament; and from this custom, bishops, in modern times, have the same honour.

ABBREVIATION OF FRACTIONS, in arithmetic and algebra, the reducing them to lower terms: that is, the proportional lessening of both the numerator and denominator. This may be performed either by continual division of the respective terms, or by dividing at once by the greatest common measure. Thus, $\frac{48}{72}=\frac{16}{24}=\frac{4}{6}=\frac{2}{3}$: by dividing both terms continually by 3, 4, and 2. Or, since 24 is the greatest common measure we have, at once, $\frac{48}{72}=\frac{2}{3}$, by dividing by 24.

ABDOMEN, or lower belly, extends longitudinally, from the pit of the stomach, to the lower part of the trunk: it is defended, in front, by the abdominal muscles; behind, by the vertebræ of the back, and, on both sides, by the false ribs.

The lower belly is divided by anatomists, into the upper, or *epigastric*; the middle, or *umbilical*; and the lower, or *hypogastric* region.

It deserves to be remarked, that the whole intestinal canal forms one continued tube, beginning with the stomach, and terminating at the anus. This canal is, generally, six times the length of the whole human subject, in proportion to the person's stature, and is by nature divided into two distinct parts; namely, the anterior, or uppermost, that is next to the stomach, comprising what are called the thin, or small intestines, which fill the middle, or fore parts of the belly; and the posterior, or lowermost, where we find the large intestines occupying the sides, and both the upper and lower parts of that cavity. The former are again divided into the *duodenum*, or twelve inch gut; the *jejunum*, or empty gut, and the *ileum*, or crooked gut; and the latter, or large portion, into the *cæcum*, or

blind gut; the *colon*, or hollow being the largest of all the intesti and the *rectum*, or the straight ex tory gut, which terminates in the anus. On opening the abdomen, we observe its viscera and intestines in the following situation: after having removed the skin and the muscles, we discover the *peritoneum*, or a membrane which envelopes all the viscera of the lower belly. This being divided, the *omentum*, or cawl, appears floating on the surface of the intestines, which are likewise seen in a moist and loose state, making numerous windings through the whole cavity. The viscera next present themselves in this order: on the uppermost part of the belly, namely, under the midriff, towards the middle, but rather inclining to the right side, lies the liver, and near its concave surface is the gall-bladder; somewhat to the left is the stomach, and laterally, contiguous to it, the spleen. The kidneys are placed about the middle of the lumbar region, or the loins, while the urinary bladder, and the parts of generation, are situated in the lower division of the belly; in that bony cavity which is denominated the *pelvis*, or basin, and the sides of which form what are commonly called the hips.

The situation of these parts, however in a natural state, frequently undergoes considerable variations, especially that of the liver, the stomach, and the spleen: and these deviations, being produced by various causes, as by a different posture of the whole body; distension of the stomach with an unusual quantity of food, either in a solid or liquid form; or lastly, during pregnancy; hence it may be understood that, with every preternatural change of their respective positions, there may arise ruptures, spasmodic contractions, callosities, accumulations of water, called dropsy, and many similar complaints.

The intestines have certain general characters, though each of them manifests its peculiarities. In the former respect, we find that they are all connected with the vertebræ by means of the mesentery; that each of them consists of different membranes, the innermost coat of which terminates in the intestinal canal itself, and forms semilunar valves inclining toward each other, contracting the tube of that passage, and often appearing in several parts more numerous and conspicuous than in others. Each gut is, farther, provided with small glands, for the secretion of a viscid humour, and many small vessels for the absorption of certain fluids. Lastly, all intestines possess, in common, a certain creeping, called the peristaltic, or vermicular motion; which is occasioned by the contraction of their muscular fibres, operating in a spiral direction, or obliquely from the upper towards the lower parts; and they are thus liable to alternate contortions in their respective situations. This curious phenomenon may be clearly perceived for some time after death, and especially in an animal recently opened.

By inverting this motion of the stomach and bowels, an effect which may be produced by certain stimulating medicines, for instance, ipecacuanha, as well as by a local irritation of the fauces, it will be easily understood, that either nausea or vomiting will be the natural consequence, according to the different degrees of the stimulus applied.

The viscera of the abdomen are, in common with other parts of the body, liable to a variety of disorders; the most formidable of which are, those arising from inflammation.

The usual symptoms of inflammations of the lower belly are, pain attended with fever; but these are by no means a *necessary* consequence; as in this, and other diseases of the Animal Economy, a slight degree of inflammation may prevail unaccompanied either by febrile symptoms, or considerable pain. The mode of discovering the existence of inflammation is, to press with the tip of the finger on the seat of the complaint; and if the viscera be inflamed, the pain will be increased in such a manner, as when we touch a bruised or tender part. For the treatment of this dangerous affection, we must refer to the article INFLAMMATION.

In order to protect the tender parts we have now described, from *external* injury, every judicious person will admit the necessity of adopting such a dress, as is best calculated to answer this useful purpose. Hence no whalebone, or other stays tightly laced, should be worn by women, nor high and straight waistbands be suffered to impede the free action of the bowels, either in boys or men. It is indeed unreasonable to expect, that the present generation can enjoy the ease and comforts of their less fashionable, though more prudent, forefathers, so long as mankind continue to encourage those customs and habits, which almost

every body deprecates, but which few have the resolution either to oppose or abandon.

ABERRATION, in astronomy, a small apparent motion of the celestial bodies, occasioned by the progressive motion of light; and the earth's annual motion in her orbit. The word is compounded of *ab* from, and *erro* to wander, because the stars appear to wander from their true situations. This apparent motion is so minute, that it could never have been discovered by observations, unless they had been made with extreme care and accuracy; and although it naturally arises from the combination of the two causes just mentioned, yet as it was never even suggested by theorists, until it was discovered by observation, it furnishes us with one of the strongest proofs of the truth of the Copernican system. The discovery is owing to the accuracy and ingenuity of Dr. Bradley, astronomer royal: he was led to it accidentally by the result of some careful observations, which he had made with a view of determining the annual parallax of the fixed stars.

Aberration, in optics, that error or deviation of the rays of light, when inflected by a lens or speculum, whereby they are hindered from meeting or uniting in the same point, called the geometrical focus; it is either lateral or longitudinal. The lateral aberration is measured by a perpendicular to the axis of the speculum, produced from the focus, to meet the reflected or refracted ray: the longitudinal aberration is the distance of the focus from the point in which the same ray intersects the axis.

ABEYANCE, in law books, something that only exists in expectation, or in the intendment, or remembrance of the law.

Abies. See FIR-TREE, or *Pinus Abies*, L

ABJURATION. A forswearing, or renouncing by oath: in the old law it signifies a sworn banishment, or an oath taken to forsake the realm for ever. In its modern, and now more usual signification, it extends to persons, and doctrines, as well as places. Thus for a man to abjure the pretender by oath, is to bind himself not to own any regal authority in the person called the Pretender, nor even to pay him any obedience, &c So to abjure allegiance with us, is to renounce by oath any political tie or obligation toward the prince or potentate under whom the emigrant formerly lived.

ABLUTION, in its literal signification, implies washing, and is usually confined to purification by the aid of water; but may also be applied to cleansing, or washing with any other pure liquid. It is a term well known in the religious world. As a practice, its antiquity is coeval with the first institution of religious ceremonies.

Ablutions were, on various occasions, enjoined by the Jewish Legislator. The Mahometans frequently have recourse to them in the celebration of those rites prescribed in the Alcoran; and they form no inconsiderable part in the established religion of almost every nation.

Egyptians, Grecians, Romans, Syrians, Cophts, Jews, Christians, &c. all admit them as forming a part of their ceremonials; by total or partial immersion of the body, by sprinklings, in baptism, and so forth.

But though used in some measure symbolically, or as emblems of that inward purity requisite to the discharge of duty, among the faithful disciples of religious institutions, yet the importance of ablutions is very considerable, when viewed in a physical sense, as being instrumental to preserve health and beauty, and not only to prevent, but in many cases to remove, disease.

ABOMASUS, a name used for the fourth stomach of ruminating beasts, or such as chew the cud. These have four stomachs: the last, where the chyle is formed. and from which the food descends into the intestines, is called the Abomasus.

ABORIGINES, originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called Campayna di Roma. Whence this people came by the appellation is much disputed. The name is now given to the primitive inhabitants of a country, in contradistinction to colonies, or new races of people.

ABORTION, or miscarriage, is in modern times, justly considered, as a misfortune; though the detestable and unnatural vice of procuring it by art, was connived at by the ancient Romans; whose disgraceful fall, as a nation, may in a great measure be attributed to their luxurious manners, and immoral habits.

Weakly and irritable, hysterical, passionate and especially voluptuous women of a plethoric habit, are most liable to miscarriage; though it may also happen from a general defective constitution, or rather from a mal-confor

mation of the sexual organs. The most frequent causes of abortion, however, are, the depressing passions, such as grief and fear; debility of the mother, especially if occasioned by great loss of blood; violent exercise of every kind, but particularly sudden stooping, and lifting weights; all diseases which agitate the whole frame, as fevers, convulsive fits, and coughing; as well as falls and blows on the abdomen; an indolent and irregular mode of living, whether too high, or on too poor sustenance; and sometimes even offensive smells.

The symptoms indicating abortion are, cold shiverings of short duration; nausea, seldom accompanied with vomiting; pain about the loins, but more frequently in the abdomen, below the navel, and in the thighs; depression and softness of the breasts; palpitation of the limbs, and more especially of the heart; sinking of the lower belly; and a discharge of various appearance from the uterus.

One of the most general expedients adopted to prevent a miscarriage, has been periodical blood-letting, either from the arm or foot; which, in plethoric constitutions, has sometimes been carried to such excess, as to be repeated every month during pregnancy. This practice, however, so prevalent in France and Germany, is hazardous, and liable to many strong objections; for, as abortions most generally occur in debilitated and nervous women, such losses of the vital fluid cannot but be attended with detrimental effects. According to the opinion of experienced practioners, bleeding is advisable only in cases where particular circumstances concur to render such a diminution necessary.

The most effectual method of preventing such accidents, consists in a regular mode of life previous to pregnancy, occasionally aided by bracing remedies, such as the cold bath, moderate exercise on horseback, or on foot; in short, all those means which tend to counteract nervous and hysteric debility, or, in other words, which are proper for irritable habits.

There are cases in which mothers are constitutionally liable to abortion, and where the combined efforts of art and nature cannot prevent a misfortune, which not only debilitates the constitution, but has also a tendency to return on a future occasion. The most critical period at which abortion may occur, are those of the third, fourth, and fifth months of pregnancy; though it may happen sooner or later. If, therefore, a woman be affected with a violent shooting pain in the back, extending to the uterus, together with the symptoms already described, it will be necessary, either to bleed her, if she be of a full and vigorous habit, or to adopt such a treatment as may be best calculated to obviate the portending danger. This consists in a very moderate, and chiefly liquid nourishment, excluding whatever may irritate the system; and a calm and composed state of body and mind. Cataplasms applied to the pit of the stomach, and opiates may occasionally become necessary; but the latter ought never to be resorted to, without proper medical advice; for there can be no doubt, that tampering with *laudanum*, or similar medicines, has often been productive of irreparable mischief. According to the uniform experience of professional men, however, the last-mentioned remedy may with more safety, and greater advantage, be employed in the form of clysters. Thus, we may confidently say, that an injection composed of six oz. or a tea-cup full of cold chamomile-tea, and fifty drops of laudanum, every other night, or, according to circumstances, more or less frequently, has been attended with the happiest effects, especially if, in the intermediate days, when necessary, an emollient clyster was administered, with a view to relieve costiveness.

With respect to the concomitant affections of pregnancy, we must be very concise. The pain in the head, and tooth-ach, may, in general, be relieved by a cool regimen and emollient diet; keeping the legs and feet sufficiently warm, and occasionally soaking them in tepid water. If these simple means do not prove successful, bleeding will sometimes become necessary, especially in plethoric and bilious females. Beside these remedies, a blister applied to the neck behind the ears, or to the part most sensibly affected, is often of great service; though in urgent cases, this application should cover the whole head. In full and robust habits, issues are eminently useful; while the bowels should be regularly opened by the mildest purgatives. Sometimes, however, the simple external application of a few drops of cajeput, juniper, or any other essential oil, operates like a charm, in removing either the tooth-ach, or violent pains of the head. In all the complaints of pregnant women,

arising from too prevailing an acidity, such as heart-burn, vomiting, cough upon taking food, and that feverish, restless state, so common in the latter period of pregnancy, Dr. John Sims directs two or three spoonfuls of the following mixture to be taken, either occasionally, or when the symptoms are continual, after every meal: viz. one drachm of calcined magnesia, five ounces, and a half of pure water, three drachms of the spirit of cinnamon, and one drachm of the water of pure ammonia. Magnesia has long been a celebrated remedy for these complaints. This judicious physician farther remarks, that the vomiting, which occurs *in early pregnancy*, seldom arises from, or is connected with, acidity; and that the remedy before specified is, in that case, not adapted to the purpose. When such vomiting is moderate, and confined to the early part of the day, it appears to be useful; but if it incessantly continue for many days together, accompanied with great loss of strength, constant thirst, and an utter inability of retaining any thing on the stomach, in this state, the most effectual remedy is, the application of a mustard plaister to the pit of the stomach; with the effervescent mixture of salt of tartar and lemon juice, or an infusion of cloves in warm water: with a constant attention to diet, that the patient may swallow nothing which has a tendency to irritate or stimulate the organs of digestion.

ABRIDGMENT, in a literary sense, is the compression of the matter of a work into a smaller compass than that in which it has been originally written. With respect to private abridgments and common-place books, theorists in education have frequently taken pains to engage youth in their compilation. On this subject, however, it may be doubted, whether the practice will confer any advantage, and even suspected that it may do much mischief. If the mind is desirous of acquiring a thorough knowledge of any particular subject, the notation of facts, dates, &c. will, no doubt, most effectually enable it to accomplish the purpose; but where this is not the design, the time that is devoted to the tedious task of copying one author, had better be employed in reading twenty.

ABSCESS is a soft, circumscribed tumour, containing matter, generally attended with fluctuation, and sometimes, though not always, with considerable pain. It is the consequence of some previous inflammation, and is often a critical effort of nature to relieve the patient from superfluous or noxious humours, and to remove an acute disease.

The mode of treatment to be adopted in the cure of an abscess, will be to assist its complete suppuration, and promote a free discharge of matter: for which purpose, all remedies that have a tendency to soften the skin, and encourage perspiration, are eminently useful. In languid habits, where the suppuration proceeds but slowly, it will sometimes be necessary to open it either by caustic applications, or the lancet.

Warm fomentations, and emollient cataplasms made either with bread and milk, or oatmeal, renewed several times a day, are the usual poultices for an abscess. In large tumours, from which the discharge of matter has been considerable, and especially in those of the lower extremities, it will often be necessary to have recourse to such internal remedies as may strengthen and support the system. Bark, wine, and if considerable pain or irritation prevail, opiates judiciously administered, will be highly beneficial.

After an abscess has been opened, it will require to be kept clean, and drest either with dry lint, or some mild digestive ointment, once or twice a day, assisted by a compress and linen bandage.

Abscesses, which are formed, on any of the more important organs of life, such as the brain, the lungs, liver, &c. are particularly to be dreaded: as, by bursting, and discharging their contents into the contiguous cavities, they frequently occasion instantaneous death. From neglect, or mismanagement, abscesses sometimes terminate in mortification, or gangrene; which subject will be farther discussed under the head of INFLAMMATION.

ABSCISS, or ABSCISSA, of a conic section, or other curve, is a part or segment cut off by a line at some certain point, which is determined by an ordinate to the curve.

Absinthium vulgare. See *Artemisia Absinthium*, L. or MUGWORT.

ABSTINENCE may be defined, the habit of refraining from what is either useful, agreeable, or pernicious: and may be divided into general and particular. In the former sense, it may signify a certain privation, whereby the senses are mortified, and the passions restrained. In the latter, it is confined

to the exclusion of certain substances, at stated times and seasons, in compliance either with the customs of particular countries, or with religious precepts. There is, also, another sense, in which the term abstinence denotes the limitation of any usual indulgence, for the purpose of preserving health, and removing the consequences of excess.

In the religious institutions of all countries, we find many regulations on this subject. The Mosaic Law forbids the eating of animals that were strangled, the use of swine's flesh, the exercise of daily labour on the Sabbath, &c. The Christian system more particularly enjoins the discipline of the passions, and an abstinence from those pleasures which have a tendency to degrade our nature.

The effects of abstinence in the preservation of health, and the cure of diseases, are, by many physicians, stated to be remarkable. Dr. E. Miller, of New York, in his Original Observations, relates that in a district of the United States, which is particularly obnoxious to epidemic diseases, the febrile attack is often obviated and diminished by a *rigid abstinence* from food: and the celebrated Sydenham declares, that he has often cured the synocha, or inflammatory fever, and other fevers, by prescribing diluent drinks, and prohibiting every kind of aliment, even, to use their own words, "*for two or three days*" The method, in this respect, adopted by Dr Miller, was to commence his plan of abstinence on the first sensations of indisposition, and continue it on some occasions for a period of twenty-four, and even forty-eight hours, until these feelings had subsided, the appetite was restored, and the calls of hunger become not only frequent, but even importunate. He concludes his interesting remarks with an aphorism, "That in those particular states of the body, which denote the *approach, and at the commencement, of acute diseases* the strict observance of a rigid and continued abstinence has been productive of the most beneficial effects."—The late celebrated author of the "*Elementa Medicinæ*," Dr. Brown, has, in that work, particularly enjoined it, as one of the means to be employed in the prevention and cure of sthenic, or inflammatory diseases; and he declares that the *cynanche tonsillaris*, or inflammatory sore throat, and the catarrh, or common cold attended with hoarseness, may often be cured by abstinence alone.

Men of genius, and persons who lead sedentary lives, are more especially benefited by occasional abstinence; as these, from the want of vigorous exercise, and their intense application, are generally the severest sufferers from diseases of repletion. In the observance of the rules of abstinence, due attention must always be paid to the age, strength, constitution, and habit of the patient.

Instances may be found, of men who have been abstemious to a degree almost incredible; and experience has demonstrated that, from habit and use, the power of abstinence may be either increased or diminished. Some persons will bear the attacks of hunger without any visible marks of impatience, while in others, a mere temporary privation will occasion the most urgent and distressing symptoms.—See the article Fasts.

ACACIA. *Robinia, Pseudo acacia*, or false acacia, is a native of the United States. It is commonly termed locust tree.

It grows best in warm, sandy land, and becomes fit for timber in about twenty-five years. The greatest use made of the trees, is for ship tunnels, fence posts, mill cogs, and fire wood; or, if worked into posts to be set into the ground for garden fences, and other inclosures, they are superior in point of durability to almost any known wood. The acacia is ornamental as a flowering tree. The blossoms unfold in June, and perfume the air to a considerable distance with their sweet and fragrant odour. It is easily cultivated. and is of quick growth. As commerce and manufactures improve, the demand for this valuable timber will increase.

The multiplication of this tree has seldom been attempted by seeds, but almost constantly by young trees sprouting up from the wounded roots of the old one. The readiness of the roots of the parent tree, to vegetate, soon after the incumbent sward is broken up by the plough, surpasses that of any other tree; for in soils favourable to their growth, the farmers are obliged to grub with great labour to prevent them from overrunning the land, and whenever suffered to indulge their native luxuriance, they will soon convert a piece of cleared land to forest. It makes good hedges.

Acacia may be propagated by setting the seeds; and, when it is once introduced, numerous plants may be obtained, by cutting its roots near the surface of the ground. As the roots extend

rapidly along the surface of the earth, and shoot up numerous suckers, the Acacia may be advantageously planted on the banks of rivers, for consolidating and securing the soil from the encroachments of the current; farther, its wood is eminently adapted to ship-building, and, though inferior in point of durability to the oak, it is perhaps preferable to any other timber for barges, and similar vessels of a small size.

The leguminous seeds of this tree, after being divested of their acrid taste, by infusing them in different waters, and afterwards ground into meal, are by the Tongusian Tartars converted into a wholesome *bread*: these seeds are also eagerly eaten by poultry, which may thus be speedily fattened.

It has been asserted, that the leaves of this tree, when prepared in the same manner as *indigo*, may with great advantage be substituted for that expensive dyeing drug. The foliage of the smaller variety of the False Acacia, however, is reputed to be better adapted for such purpose: its culture corresponds with that above stated; and it certainly merits to be more generally cultivated in ornamental shrubberies, where it thrives rapidly, and produces elegant odoriferous yellow flowers, which abundantly supply bees with honey. The seeds of both varieties also afford a large proportion of expressed oil. It deserves to be noticed, that th yellowish wood of these trees, though hard and tough, is very brittle while the plants are young, and they ought, therefore, in exposed situations, to be supported by stakes. Lastly, it is remarkable, that no part of the acacia is subject to the depredations of vermin or insects.

The leaves of acacia are said to afford an agreeable nourishment to horses and horned cattle. They may be given either green or dry, alone or mixed, with hay or chopped straw.

The flowers of the acacia are said to be used by the Chinese in making that beautiful yellow with which they stain their silks and stuffs, and colour their paper, in the following manner: take half a pound of these flowers before they are fully blown, and roast them over a clear and gentle fire in a very clean copper pan, continually stirring them with a brisk motion; when they begin to turn yellow, pour on a little water, and let it boil till it become thick, and acquire a deeper colour; then strain the whole through a piece of coarse silk. To the liquor thus expressed, add half an ounce of alum, and one ounce of calcined and finely-powdered oyster shells: when the whole is well mixed, it will be fit for use.

ACADEMICS, a sect of philosophers, who followed the doctrine of Socrates and Plato, as to the uncertainty of knowledge, and the incomprehensibility of truth. Academic, in this sense, amounts to much the same with Platonist; the difference between them being only in point of time. They who embraced the system of Plato, among the ancients, were called Academici; whereas those who did the same since the restoration of learning, have assumed the denomination of Platonists.

ACADEMY, in the modern acceptation, is a society of persons united for the pursuit of some objects of study and application, as the Royal Academy of Arts of London, and the Royal Academy of Sciences of Berlin. The term is derived from a house and gardens, once the residence of Academus, a celebrated Athenian, in which Plato and his disciples held philosophical conversations.

ACCELERATION, in mechanics, the increase of velocity in a moving body. Accelerated motion is that which continually receives fresh accessions of velocity, and is either equally or unequally accelerated. Acceleration stands directly opposed to Retardation, which denotes a diminution of velocity. See MECHANICS.

ACCENT, is 1. The manner of speaking or pronouncing. 2. The sound of a syllable. 3. The marks made upon syllables to regulate their pronunciation. 4. A modification of the voice, expressive of the passions or sentiments. It is also used for a character placed over a syllable, to mark the accent, i. e. to shew it is to be pronounced in a higher, or in a lower tone; and to regulate the inflexions of the voice in reading. It is distinguished from emphasis, as the former regards the tone of the voice, the latter the strength of it. We reckon three grammatical accents in ordinary use, all borrowed from the Greeks, viz. the acute accent, which shews when the tone of the voice is to be raised. In modern writings it is a little line, or virgula, placed over the vowel, a little sloping or inclined, in its descent, from right to left, as ´. It is not ordinarily used, either in English or Latin: the French, indeed, retain it; but it is only to mark the close or masculine é. The grave accent.

when the note or tone of the voice is to be depressed; and is figured thus \`. The circumflex accent, which is composed of both the acute and the grave; it points out a kind of undulation of the voice, and is expressed thus ˜ or ^.

Accent, in music, is a modulation of the voice, to express a passion. Every bar or measure is divided into accented and unaccented parts. The accented parts are the principal; being those intended chiefly to move and affect; it is on these the spirit of the music depends.

ACCEPTANCE, in commerce, is when a man subscribes, signs, and makes himself a debtor for the sum contained in a bill of exchange, or other obligation, drawn upon, or addressed to him; as thus:

"London, January 20, 1811.

"Sir,

"Two months after date, pay to Mr. "John Doe, or his order, the sum of "one hundred pounds, for value re-"ceived of, Sir,

"Your obedient servant,

(*Signed*) "RICHARD ROE.

"*Accepted*,

"*L* 100 0 0 "THOMAS STYLES.

(*Addressed*)

"Mr Thomas Styles,

"Broad-street Buildings."

In this case Mr. Thomas Styles makes himself liable to pay 100*l* to Mr John Doe or his order.

If there be a right understanding between both parties, a small matter amounts to an acceptance as, "Leave "your bill with me, and I will accept "it;" or, "Call for it to morrow, and it "shall be accepted" This obliges as effectually, by the custom of the merchants, and at law, as if the party had actually signed the bill.

ACCESSARY, in common law, is chiefly used for a person guilty of a felonious offence, not principally, but by participation: as, by advice, command or concealment. There are two kinds of accessaries: before the fact, and after it The first is he who commands or procures another to commit felony, and is not present himself; for if he be present, he is a principal. The second is he who receives, assists, or comforts any man that has done murder, or felony, whereof he has knowledge

ACCIPITRES. The first order of the Linnéan class of Birds. the ordinal character being, bill somewhat hooked downwards, the upper mandible dilated near the point, or armed with a tooth; nostrils open; legs short and strong; feet formed for perching, having three toes forwards and one backwards; toes warty under the joints; claws hooked and sharp pointed; body muscular; flesh tough, and not fit to be eaten; food, the carcasses of other animals, which they seize and tear; nest in high places: eggs about four; female larger than the male: they live in pairs. The birds of this order subsist by preying on other animals There are four genera, viz. the *Vultur*, *Falco*, *Strix* and *Lanius*.

ACETATES, in chemistry, certain neutral salts formed by the combination of the acetic acid, or radical vinegar, with different substances, or bases These salts differ from acetites in this respect, the acid employed in the production of the former is fully saturated with oxygen, or the acidifying principle, that is, it is completely acid; while that which is used to form the latter, contains a less proportion of oxygen than is sufficient to saturate it The different acetates are expressed by the addition of the word denoting the substance to which the acid is united, as acetate of lime, &c.

ACETIC ACID, in chemistry, one of the vegetable acids, produced by distilling the acetous acid with metallic oxydes. It is of a green colour, but becomes white by rectification It is extremely volatile and inflammable; corrodes and cauterises the skin, and when heated in contact with air, takes fire Combined with earths, alkalies, and minerals, it forms salts called acetates

ACETITES, compound or neutral salts, formed by the union of the acetous acid, or distilled vinegar, with different bases: the most remarkable of these substances, and those whose properties are best known, are the acetite of alumene, copper and lead

ACETOUS ACID, *distilled vinegar*, or the acid of vinegar, is obtained from mucilaginous substances by that degree of fermentation which succeeds the spirituous, called the acetous fermentation, and by concentrating the product. It is a transparent colourless fluid, of the specific gravity of 1,0095, nearly as volatile as water, exhaling a pungent fragrant odour, and of a lively agreeable taste.

Acer campestre, L See COMMON MAPLE.

Acer pseudo-platanus, L. See Sycamore Tree.

Acetite of Copper. See Verdigris.

Achillea millefolium, L. See Milfoil, or Common Yarrow.

ACIDS are obtained from vegetable and mineral substances, either by fermentation or distillation.

The vegetable acids, however, such as the juice of limes and lemons, are frequently procured without the aid of art. With respect to their general effects, it may be said that they stimulate the appetite, promote digestion, quench thirst, and, in hot seasons and hot climates, counteract the putrid tendency of the animal humours: they afford an excellent remedy in bilious and inflammatory diseases, but particularly in the true scurvy; and are the most effectual antidotes against the narcotic vegetable poisons. Thus, a powerful dose of opium may be checked in its soporific effects, if a proper quantity of the acid of lemons be taken with, or immediately after it. For instance, four grains of opium, or one hundred drops of laudanum, form a large dose; but if one ounce of pure lemon juice, or twice that quantity of good vinegar, be added to every grain of opium, or to twenty-five drops of laudanum, we can declare from experience, that such a compound will produce a very different effect. Instead of stupefying the head, and producing the usual costiveness, it will not only relieve the bowels, but also occasion a degree of cheerfulness, never attained by the use of opium alone or strong liquors, and afterwards induce composed and refreshing sleep. Hence the use of acids, to persons who are habitually obliged to take considerable doses of opiates, cannot be too strongly recommended. The mild vegetable acids, such as vinegar, when sprinkled about the floors and walls of rooms inhabited by patients labouring under putrid disorders, especially in the heat of summer, have a good effect.

[Lemon juice and lime juice may be preserved by straining the juice through fine muslin or filtering paper, and adding as much loaf sugar as is necessary to make it sweet; then putting it in a bottle, which must be nearly filled, corked, waxed, tied over with wet bladder, and put into boiling water for an hour. Let it cool gradually, and put it by for use.

The concrete lemon acid is used in England by the callico printers, to discharge buff colour or iron stain in patterns where the piece has been dyed throughout. The concrete salt sells for eight dollars the pound weight. The uncrystallised solution is now substituted. The common concrete lemon acid, so called, sold in Philadelphia, is sometimes cream of tartar, rendered soluble by a small quantity of oil of vitriol, which forms a sulphat of potash with the alkali contained in the cream of tartar, and renders this latter soluble in water; or it is tartaric acid: both the one and the other forming an unwholesome beverage.—T. C.]

As a substitute for the acid of lemons, we refer to the article Berberris.

The mineral acids are productive of very different effects: when applied in a diluted state to the human body, whether externally or internally, they generally contract, and gently stimulate, the animal fibre; but, in a concentrated form, violently stimulate, corrode, and destroy its texture.

Acid, in chemistry, is the generic name of a comprehensive class of substances, which possess the following properties: sourness of taste; a power of changing blue vegetable colours to red; of forming with water a combination whose specific gravity is not a medium between the water and the acid; and of combining (and usually effervescing) with all the alkalies, and most of the metallic oxydes and earths, by which means those compounds are formed which are called neutral, or secondary salts. Though every acid does not possess all these properties, yet they all possess a sufficient number of them to distinguish them from other substances. The form under which acids most commonly appear, is that of a transparent liquor, in which case they are generally combined with a greater or less quantity of water: several of them, however, are found in a solid state, as Benzoic acid, or the flowers of Benzoin; and some exist in a state of gas, as carbonic acid gas. Acids are divided into four classes, according to their bases or radicals: First, those with simple radicals, of different kinds. Secondly, those with double radicals, viz. carbon and hydrogen, in different proportions. Thirdly, those with triple radicals, carbon, hydrogen, and azote. And fourthly, those with unknown radicals. The old chemists were only acquainted with the three mineral acids, as they are called, the sulphuric, the nitric, and the muriatic, besides the acetous acid, or vinegar.

ACIDULATED WATERS, generally

called *Acidulæ*, a species of mineral waters, which contain a considerable quantity of carbonic acid, and which are known by the poignancy of their taste, the sparkling appearance which they assume when shaken or poured from one vessel into another, and the facility with which they boil, as Seltzer and Soda waters.

ACORNS, or the seeds of the oak, have seldom been used for medicinal purposes.

They possess an astringent quality, which may be extracted by steeping them in cold water, or boiling them. On expression, they also afford an oil, which may be advantageously used in the burning of lamps.

In the year 1756, an ingenious gentleman, Mr. ELLIS, invented a method of preserving acorns for a considerable time, and of retaining in them the power of vegetation, by encasing them in wax. In this manner, they may be transported to distant climates, and preserved in a fresh state for several years; so that they can be transplanted with hopes of success. In this way the English oak might be grown here.

Acorns afford a very proper and nutritious food for hogs, which are readily fattened by their use: and we are farther convinced from their analogy to the horse chesnut, that, by depriving them of their husks, soaking them carefully in *several* infusions of fresh water, then drying and reducing them to flour, they would, *in times of scarcity*, serve as a tolerable substitute for corn bread: for by this simple, though troublesome, process, most of the astringent vegetables lose their acrid and bitter taste.

ACORUS CALAMUS, L. The common Calamus aromaticus, or Sweet Flag, grows in marshy situations, and in shallow water, and may be known by its long, sword-shaped leaves, resembling these of the flag, but narrower, of a brighter green, waved along one of the edges, and also by its oblong, cylindric spike of flowers coming from the side of the stem at the edge of the leaf. The root is like that of the flag, long, cylindric, tuberous, spongy, marked with rings, and putting out abundance of fibres, which, indeed, are the proper roots. It has a strong aromatic smell, and a warm pungent, bitterish taste. The flavour is greatly improved by drying. It possesses carminitive and stomachic virtues, and is frequently used as an ingredient in the morning bitters in this country, in places subject to ague.

M. BAUTROH has used the whole plant for tanning leather; and Dr. BOHMER remarks, that the French snuff, called *à la violette*, probably receives its peculiar scent from this fragrant root. Neither horses, cows, goats, sheep, nor hogs, will eat the herb or roots of this vegetable.

ACOUSTICS is the science which instructs us in the nature of sound. It is usually divided into two parts, viz. 'diacoustics,' which explains the properties of those sounds that come directly from the sonorous body to the ear; and 'catacoustics,' which treats of reflected sounds. Almost all sounds that affect us are conveyed to the ear by means of the air; but water is a good conductor of sound; so also are timber and flannel.

A bell rung under water returns a tone as distinct as if rung in the air.

Stop one ear with the finger, and press the other to one end of a long stick, or piece of deal wood, and if a watch be held at the other end of the wood, the ticking will be heard by the wood or stick ever so long.

Tie a poker on to the middle of a strip of flannel, two or three feet long, and press with the thumbs or fingers the ends of the flannel into your ears, while you swing the poker against an iron fender, and you will hear a sound like that of a very heavy church bell. These experiments prove that water, wood, and flannel are good conductors of sound, for the sound from the bell, the watch, and the fender, pass through the water, and along the deal and flannel to the ear.

It must be observed, that a body, while in the act of sounding, is in a state of vibration, which it communicates to the surrounding air, the undulations of the air affect the ear, and excite in us the sense of sound. Sound, of all kinds, it is ascertained, travels at the rate of thirteen miles in a minute: the softest whisper travels as fast as the most tremendous thunder. The knowledge of this fact has been applied to the measurement of distances.

Suppose a ship in distress fire a gun, the light of which is seen on shore, or by another vessel, 20 seconds before the report is heard, it is known to be at the distance of 20 times 1,142 feet, or little more than four miles and a half.

Again, if I see a vivid flash of lightning, and in two seconds hear a tremendous clap of thunder, I know that the thunder cloud is not more than 760 yards from the place where I am, and

should instantly retire from any exposed situation.

The pulse of a healthy person beats about 70 times in a minute; if, therefore, between a flash of lightning and the thunder, I can feel 1, 2, 3, 4, &c. beats of my pulse, I know the cloud is 900, 1,800, 2,700, &c. feet from me.

Sound, like light, after it has been reflected from several places, may be collected into one point as a focus, where it will be more audible than in any other part: on this principle whispering galleries are constructed.

Speaking trumpets, and those intended to assist the hearing of deaf persons, depend on the reflection of sound from the sides of the trumpet, and also upon its being confined and prevented from spreading in every direction. A speaking trumpet, to have its full effect, must be directed in a line towards the hearer The report of a gun is much louder when fired towards a person, than one placed in a contrary direction.

An echo is the reflection of sound striking against a surface adapted to the purpose, as the side of a hill, house, wall, &c.

ACRE, a denomination used in the measurement of land: an acre consists of four square roods, each containing 40 perches, or poles. In different countries it varies, according to the length of the pole, which is from $16\frac{1}{2}$ to 28 feet. It is also divided into ten square chains of 22 yards each, or 4840 square yards

The *English statute acre* comprises 160 square poles, each of which contains $16\frac{1}{2}$ feet. The same measure of land, in Scotland, is regulated by the Scotch ell, which is $37\frac{2}{10}$ English inches · thus, 36 square ells make 1 *fall*; 40 falls, 1 rood; and 4 roods constitute an acre; so that the proportion of a Scotch to an English acre is nearly as that of 5 to 4. The acre employed in the Principality of Wales, is equivalent to two English ones; and the Irish acre is equal to one acre, 2 roods, and 19 perches $\frac{27}{121}$ of English statute measurement

ACROSTIC, a poem, the lines of which are so contrived, that the first letters of each, taken together, will make a proper name or other word.

ACT. Act, in the universities, is the delivery of orations, or other exercises, in proof of the proficiency of a student who is to take a degree At Oxford the time when masters or doctors complete their degrees, is called the *act*. At Cambridge, the same period is called the *commencement*

Act of Faith, or *auto-da-fé*. In dark and barbarous countries where the Spanish inquisition had power, the *act of faith* was a solemn murder of infidels and heretics, usually performed on some great festival, and always on a Sunday.

Act of Parliament is a positive law, consisting of two parts, the words of the act, and its true sense and meaning; which, being joined, make the law. The words of the acts of parliament are to be taken in a lawful sense. Cases of the same nature are within the intention, though without the letter, of the act; and some acts extend, by equity, to cases not mentioned therein.

ACTEA SPICATA, L. Herb Christopher. The dry leaves are extremely sharp and rough, so that they may be usefully employed for polishing hard wood and ivory. The berries boiled with alum, yield a deep black dye; and THIELBIN, a German writer, asserts that, the red berries of the actea spicata give a beautiful dye, equal to that obtained from cochineal; after boiling them with cream of tartar, and dropping into the decoction, a solution of tin in aqua fortis, the colour became permanent. We believe he alludes to the berries produced by another species of this herb, the actea rubra

The A Spicata has two varieties in the United States · 1. A alba with very white transparent berries; 2 A. rubra with red berries.

ACTEA RACEMOSA, black snake root, or rich weed, is a very beautiful plant when in flower. The utility of the root of this plant, is well known It is an astringent; and Dr. BARTON says, it was used in the form of decoction as a gargle, with success, in a putrid sore throat, which prevailed in New Jersey many years ago. A decoction of the root cures the itch

ACTION, in law, denotes either the right of demanding in a legal manner, what is ones due, or the process brought for the recovering the same.

ACUTE DISEASES are such as are either attended with inflammation, or other urgent symptoms, which bring on an early crisis, and render them dangerous in their consequence: hence they are opposed to chronic diseases, or those which, though of slower progress, may nevertheless terminate in dissolution As the former are more

in need of the immediate assistance of art, we shall state the most proper methods of treating them in their commencement, as well as the suitable diet and regimen to be observed in them, under the different heads of APOPLEXY, ASTHMA (suffocative), CHOLERA MORBUS, CHOLICS, CONVULSIONS, CRAMPS or SPASMS, EPILEPSY, FEVERS (inflammatory), FRACTURES, HYDROPHOBIA, INFLAMMATIONS, &c. &c.

ADIT OF A MINE, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the same with cuniculus or drift, and is distinguished from an air-shaft.

The adit is usually made on the side of a hill.

ADJUTANT, a military officer, whose duty it is to carry orders from the major to the colonel and sergeants. When detachments are to be made, he gives the number to be furnished by each company or troop, and assigns the hour and place of rendezvous. He also places the guards, receives and distributes the ammunition to the companies, &c.; and, by the orders of the major, regulates the prices of provisions.

ADJOURNMENT, the putting off a court or other meeting till another day. In parliament, adjournment differs from prorogation, the former being not only for the shorter time, but also done by the house itself, whereas the latter is an act of royal authority.

ADMINISTRATOR, in law, is he to whom the administration of the goods of a deceased person, in default of an executor, is committed. If the administrator die, his executors are not charged with the administration; but a new administration is granted. This office was established by an act made in the 31st year of Edward III. Administrator de bonis non, is a supplementary administrator appointed to administer and dispose of the goods of the deceased not yet disposed of, on account of the death or absence of a former administrator.

ADMIRAL, is the commander in chief of any single fleet, or, in a general way of speech, any flag-officer whatever, as, though improperly, vice and rear admirals are called admirals.

Vice admiral, is the commander of the second squadron, and carries his flag at the fore-topmast head.

Rear-Admiral, is the commander of the third squadron, and carries his flag at the mizen-topmast head.

Vice-Admiral, is also an officer appointed by the lords commissioners of the admiralty for executing jurisdiction within prescribed limits.

Admiralty, Court of, is a sovereign court held by the lord high admiral, or by the lords-commissioners of the admiralty, where cognisance is taken in all maritime affairs, whether civil or criminal. All crimes committed on the high seas, or on great rivers below the first bridge next the sea, are cognisable in this court only, before which they must be tried by a judge and jury. By the late act of the 39th of his present majesty, it is enacted, "That all offences committed upon the high seas, out of the body of any county, shall be, and are declared to be, offences of the same nature respectively, as if they had been committed upon the shore." In consequence of which act, all offences committed on the high seas are now to be heard and determined before a jury, as at common law. In civil matters, the verdict lies in the breast of the judge; but there is an appeal to the court of delegates; and from the vice-admiralty courts in foreign settlements an appeal may be brought before the court of admiralty here, or before the king in council. The advantages resulting to mariners from suing in the court of admiralty, rather than in the common courts of law, are, 1st, A whole ship's company may join in a suit for wages, by which means the expense is lessened; and 2d. The ship itself is responsible to the admiralty, and not to the owners. A third province of the court of admiralty relates to the law of nations. It belongs to this court to decide whether a captured ship be a lawful prize or not? If the affirmative is declared, the ship is said to be condemned.

ADVERB, a word joined to verbs, expressing the manner, time, &c. of an action. Example. It is conducive to health to rise *early*: here the word early is an adverb, and is joined to the verb rise.

ÆOLIPILE, in hydraulics, a hollow ball of metal, with a small hole or opening; chiefly used to shew the convertibility of water into elastic steam. The best way of fitting up this instrument, is with a very slender neck or pipe, to screw on and off, for the convenience of introducing the water into the inside; for by unscrewing the pipe, and immerging the ball in water, it readily fills, the hole being pretty large; and then the pipe is screwed

on. But if the pipe do not screw off, its orifice is too small to force its way in against the included air; and therefore to expel most of the air, the ball is heated red hot, and suddenly plunged with its orifice into water, which will then rush in till the ball is about two-thirds filled with the water. The water having been introduced, the ball is set upon the fire, which gradually heats the contained water, and converts it into elastic steam, which rushes out by the pipe with great violence and noise; and thus continues till all the water is so discharged; though not with a constant and uniform blast, but by fits: and the stronger the fire is, the more elastic will the steam be, and the force of the blast. Care should be taken that the ball be not set upon a violent fire with very little water in it, and that the small pipe be not stopped with any thing; for in such case, the included elastic steam will suddenly burst the ball with a very dangerous explosion.

ÆOLUS'S HARP, a very pleasing musical instrument, invented by Kircher. The construction is perfectly simple, consisting of little more than a number of catgut or wire strings, distended in parallel lines over a box of wood, with a thin top containing sound holes When the strings are tuned in unison, and the instrument is placed in a proper situation to receive a current of air, it produces, by the tremulous motion given by the wind to the strings, a soft, murmuring, and pleasing combination of sounds, which is beautifully described by Thomson in his Castle of Indolence.

ÆTHER, a term formerly used to signify a thin subtle matter, finer than air, and completely filling the whole space of the firmament.

Æther is a term now applied to a chemical composition.—It is a combination usually of vitriolic acid and spirits of wine, and is used for a variety of medical purposes. It has been used in cases of rheumatism, gout, and hooping-cough, with great success. In a paroxysm of suffocating asthma, and all those diseases where the organs of respiration are affected, half a tea-spoonful of vitriolic æther in a table-spoonful of water, quickly swallowed and occasionally repeated, has often produced instant relief. Even the simple evaporation of this volatile fluid, a spoonful of which may be placed at a time in a shallow vessel contiguous to the patient, has frequently been found of service, and alleviated the most distressing shortness of breath. It forms an useful addition (in the dose of about 30 drops) to laudanum in fits of the gout.

ÆTIOLATION, a term denoting the state of vegetables which, by growing in the shade, and being deprived of light, become pale, white, and insipid. How this change is produced, the present state of our knowledge will not permit us to explain; but it is a fact of general observation, that the colour of herbs is pale or deep in proportion as they are less or more exposed to the rays of the sun; and those which, for the want of those rays, are pale or white, are said to be ætiolated, from a French word signifying star, as if they grew by star-light.

ÆRA, or *Era*, a fixed historical period whence years are reckoned: as the building of Rome, or the birth of Christ. *See* EPOCH.—Era and Epoch are not exactly synonymous. An era, is a point fixed by a particular people or nation; an epoch, one determined by chronologists and historians. The idea of an era, also, comprehends a certain succession of years, proceeding from a fixed event; and an epoch is that event itself. Thus, the christian era began at the epoch of the birth of Christ. See CHRONOLOGY

AERONAUT, one who sails in the air. The term is applied to a person who ascends with an air-balloon.

AEROSTATION, aerial navigation, or the art of passing through the atmosphere in a buoyant state. Hence, also, the machines which are employed for this purpose are called aerostats, or *aerostatic* machines, and, from their globular shape, *balloons*. In the ancient history or romance of almost every nation, instances of persons travelling through the air have been related; and among the philosophers of Europe, since the revival of letters, the possibility of a mechanical contrivance, by means of which a man might rise into the air, or at least descend from heights with safety, has sometimes been discussed. The first experiments that may be strictly said to have introduced balloons, were made about the year 1766. In the year 1781, the Montgolfiers, considerable paper-manufacturers of Annonay, in France, raised a fine silk bag of an elongated oval shape, to the height of seventy feet. M Pilatre-de-Rozier, who afterwards fell a sacrifice to the project, was the first to ascend with a balloon His voyage took

place on the 15th of October, 1783, in the neighbourhood of Paris. The success of former experiments, induced MM. Charles and Roberts to make an attempt, upon a principle somewhat different from those that had been employed, with a balloon of a spherical form. They rose from Paris, and descended at the distance of twenty-seven miles. There, M. Roberts left the boat or car; but the balloon still retaining a considerable quantity of inflammable gas, and its burthen being thus lightened, M. Charles resolved to take another voyage by himself. He was carried up with so much velocity, that in twenty minutes he was almost 9000 feet high, and entirely out of sight of terrestrial objects. At the moment of his parting from the ground, the globe had been rather flaccid; but it soon began to swell, and the inflammable air escaped from it in great quantity, through the silken tube. He frequently opened the valve, that it might be the more freely emitted, and the balloon effectually prevented from bursting. The heat of the inflammable gas being considerably greater than that of the external air, the former diffused itself all around, and was felt like a warm atmosphere; but, in the space of ten minutes, the thermometer indicated a variation of temperature as great as that between the warmth of spring and the ordinary cold of winter. M. Charles's fingers were benumbed by the cold: and he felt a violent pain in his right ear and jaw, which he ascribed to the dilatation of the air in these organs, as well as to the external cold. The beauty of the prospect which at this juncture presented itself, made amends, however, for these inconveniences. At his departure, the sun was set on the valleys; but the height to which M. Charles was got in the atmosphere rendered its orb again visible, though only for a short time. He saw, for a few seconds, vapours arising from the valleys and rivers. The clouds seemed to ascend from the earth, and collect, one upon another, still preserving their usual form; though their colour was grey and monotonous for want of light in the atmosphere. By the radiance of the moon, he perceived that the machine was turning round with him in the air; and he observed that there were also contrary currents which brought him back again. He beheld, with surprise, from some unusual effect of the wind, the streamers of his banners pointed upward; a circumstance which, as he was moving horizontally at the time, cannot be attributed either to his ascent or descent. At last, recollecting his promise of returning to his friends in half an hour, he pulled the valve, to release a portion of the gas. When within 200 feet of the earth, he threw out 2 or 3 pounds of ballast, which rendered the balloon again stationary; but in a little time afterward he gently alighted in a field about three miles distant from the place where he set out; though making allowance for all the turnings and windings of the voyage, he supposed that he had travelled nine miles at least. By the calculations of Maunier, he rose 10,500 feet; a height somewhat greater than that of Mount Etna. During this voyage, the idea of guiding the machine by means of oars suggested itself to M. Charles; and this new experiment was made by M. Blanchard, who found, however, that the strength he could apply in his apparatus was not great enough to counteract, in any sufficient degree, the impression of the wind.

The only expedition in which a balloon has appeared to accomplish a practical purpose, was that of M. Blanchard and Dr. Jefferies, who, in the month of January, 1785, crossed the Straits of Dover, and in the space of about three hours alighted safely in the forest of Guiennes. In the month of September, in the same year, Mr Baldwin ascended from Chester in Mr. Lunardi's balloon. His account of the prospect which the earth afforded is extremely curious. At the height of what appeared seven miles, though, by the barometer, it was only a mile and a half, he had a grand and most enchanting view of the city of Chester and its environs. The river appeared of a red colour; the city of a blue, and very diminutive. The whole looked a perfect plain; the highest building having no apparent height, and every thing seeming reduced to the same level. The lowest bed of vapour was of a pure white, in detached pieces, uniting as they rose: at the second height, the clouds appeared, to use Mr. Baldwin's expression, as a sea of cotton, tufted here and there by the action of the air. The prospect presently became an extended white floor of cloud, the upper surface being smooth and even. Above this white floor, Mr. Baldwin observed, at great and unequal distances, a vast assemblage of thunder clouds, each parcel containing [illegible]es in ex

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tent, of the densest form; he compares their shape and appearance to the smoke of pieces of ordnance, consolidated, as it were, into masses of snow, and penetrating through the upper surface of common clouds, and there remaining and visible at rest; while some, moving slowly in various directions, completed a view truly majestic.

As we cannot give a detail of all the aerial voyages made in this and other countries, we shall only mention those of Mr. Garnerin, in one of which he ascended at Ranelagh, near London, and descended at Colchester, a distance of 60 miles in about three quarters of an hour. This was in June, 1802; but in Sept he ascended from North Audley-street, London, in order to shew that he could come down in safety, by means of a parachute: which he did, in a field near St. Pancras church. The balloon used on this occasion, was of the common sort, viz. of oiled silk, with a net, from which ropes proceeded that terminated in or were joined to a single rope, at a few feet below the balloon. To this rope the parachute was fastened. The parachute was a large umbrella, about 30 feet in diameter, but destitute of ribs or handle. Several ropes about 30 feet in length, proceeded from the edge of the parachute terminating in a common joining, from this, shorter ropes were fixed, to the extremities of which a circular basket was fastened. In this Mr. Garnerin placed himself, and when every thing was steady, he cut the rope, and in an instant was separated from the balloon, trusting his safety to the parachute. For a few seconds, before the parachute opened, he fell with very great velocity, but as soon as that expanded the descent became gradual. On coming to the earth, Mr. Garnerin experienced some pretty severe shocks, but without receiving any material injury.

As *hydrostatics* is the science of the weight of water, so aerostatics is that of the weight of air: air and water are both fluids: and a balloon rises into the one, upon the same principle that a vessel floats upon the other. Air is lighter than water; and, therefore, a body, containing a quantity of air greater in bulk than the water it displaces, will swim; and rarefied or inflammable air being lighter than the common atmosphere, a body containing either the rarefied or inflammable air will ascend till its nature is altered, or it arrives in a fluid as light as itself, and consequently has gained the surface of the heavy atmosphere The most familiar exposition of this principle that can be offered, may be seen in those air-bubbles which, on pouring water rapidly into a glass, arise, with the utmost velocity, from the bottom to the surface, and there, becoming stationary, form a temporary froth. The water represents the air, and the air-bubble the balloon. See more on this subject under the article PNEUMATICS.

ÆTNA. A volcano or burning mountain of Sicily, situated in lat. 38 N. long. 15 1-2 E —This mountain, famous from the remotest antiquity both for its bulk and terrible eruptions, stands in the eastern part of the island, in a very extensive plain, called Val Demoni, from the notion of its being inhabited by devils, who torment the spirits of the damned in the bowels of this volcano. Authors are not agreed as to its dimensions, or its height above the surface of the sea. The accounts given of the phænomena which have accompanied its eruptions, by sir William Hamilton and Mr. Brydone, are exceedingly interesting. According to the observations of the last mentioned traveller, the height of Ætna is about 12,000 feet. Faujas de S. Fond states it at 10,036 feet. The circumference of the base is commonly reckoned about 180 miles. There are 77 cities, towns, and villages, scattered over different parts of the sides of this mountain, and the number of its human inhabitants above is, 100,000. The distance from Catania to the summit exceeds 30 miles. The fire which is continually burning in the bowels of this mountain, led the poets to place here the forges of the cyclops, under the direction of Vulcan, and the prison of the giants who rebelled against Jupiter. The eruptions of this mountain have likewise been described by several of the ancient poets.

AFFINITY, in natural philosophy, 1. The tendency which the particles of matter have to be attracted or united to each other. 2. Elective attraction, simple, reciprocal, or double. 3. Sympathy or consent of parts. The power by which one organ is affected by another, whether directly or inversely.

After-birth. See MIDWIFERY.

AFTERSWATH, *Aftermath*, or *Aftersward*, in husbandry, the grass which grows up after mowing: it is called in some counties ROWEN.

AGARIC of the oak, or the *Agaricus Quercinus*, L. is well known as a styptic, when applied to external wounds.

M. Anouillet, an eminent French surgeon, has employed it, instead of ligatures, on the arteries, in cases of amputation, by applying small pieces of it to the mouths of these vessels, and afterwards covering the stump with lint.

Another species of agaric, namely, the common *puff-ball*, has, by farriers also, been used as a styptic; but its efficacy has been disputed by Mr. Neale, a surgeon of the London Hospital, who published some observations on the subject, in the year 1757. He asserts, that he has seen it used on several occasions, and frequently employed it himself, without effect, nay, to the detriment of the patient.

Agaricus Muscarius, L. See Musky Mushroom.

AGE signifies any period of duration. It is indiscriminately used to express many objects and situations, but is more frequently applied to the latter or advanced periods of human life; and in this sense, it is accompanied with the epithet *old*.

Human existence has been divided into four distinct periods, viz. infancy, youth, manhood, and old age. The gradation through these successive stages is often slight and imperceptible; it may be either accelerated or retarded, according to the more or less prudent conduct of the individual, the mode of life which is pursued, and the various rules and precautions observed in diet, regimen, &c.

Age, signifies 1. Any period of time attributed to something, as the whole, or part of its duration. 2. A succession or generation of men. 3. The time in which any particular man, or race of men, lived. 4. In a man, the age of 14 years, is the age of discretion; and 21 years is the full age. A woman at 21 is able to alienate her lands. By the Roman law different ages were ascertained for different purposes Thus the consular age, or that at which a person might hold the consulship, was the 43d year. The judiciary age, between the 30th and 60th year. The military age, 17 years. The prætorian age, 40 years. The legitimate age, 25 years.

Age. Among ancient physiologists, the life or age of man was divided into six stages; pueritia, or childhood, extending from birth to the year five: adolescentia, or boyhood, to the year 18: juventus, or youth, to the year 30: virilis ætas, manhood, to 50: senectus, old age, to 60: crepita ætas, decrepitude, to death.

AGRICULTURE is the art of cultivating the earth, so that it may produce the vegetables we desire in their greatest perfection. It may be divided into two branches; namely, theory and practice. The former particularly treats of the various means of preparing and managing the soil and manure, and of the different kinds of vegetables which are adapted to particular soils, and most proper to be raised for the consumption of men, cattle, &c. The latter relates to the implements of husbandry, the various methods of cultivating land, raising crops, and feeding cattle.

To enter at large into this important but too extensive subject, would occupy, even briefly treated, twice as many volumes as this work consists of; but the subsequent extracts will serve to amuse as well as to inform our readers.

The following is General Humphreys's ironical advice to farmers, which contains much playful good sense; to which we subjoin the remarks of Mr. Cooper, in the Port Folio for November, 1816.

"Let us then see what further may be done with the stubborn soil, by following specifically my directions. My book, of which I now offer a specimen, is to be intitled '*Advice to Young Farmers*.'

"1st. It is taken for granted you have farms, of larger or smaller dimensions. Farms must be open, or inclosed. There is no other alternative. Respecting *inclosures*, about which they have lately made such a terrible fuss in England, I shall tell you plainly and plumply what may, perhaps, help you out of your quandary. I have been in countries where there were *many*, and where there were *none*; and did not learn that the people and cattle lived longer, or grew fatter, in one than in the other. Therefore I take it both are equal in point of advantage; in expense, not so. Fences cost money. Money is scarce, and better applied to a hundred other purposes; for example, at the merchants' and grocers', for gewgaws and grog. A hint to the wise. I see to whom I nod.

"2d. If you have a large farm, scratch over as much as possible. Your neighbours will think you are doing wonders. You will not have much labour or expense in gathering your harvest. To reduce labour and expense to their *minimum*, in any thing, is a desideratum (*I think I shall have a patent for this*) Besides, great crops are great robbers of soil As moral men

and good citizens, you must by all means discourage robbery.

"3d. If your farm be small, do not raise great crops, to make mischief by getting into the newspapers, and provoking *envy* in your richer neighbours. *Envy is an odious, abominable passion.* If you are the cause, you must be answerable for the consequence.

"4th. Do not use manure to enrich land, as if you could mend Nature's works. Rather imitate the conduct of the cleanly Dutchman in Albany, who, if report says true, "*sled* it out," from their barn-yards and lay it on the ice, so that it may go off with the first thaw. Every body knows MUCK—another appellation for *filth*—is offensive to the sight and smell, and a perfect nuisance. Pray, why, otherwise, should the police of well regulated cities insist on getting rid of nuisances?

"5th. Plough not frequently, nor deep. It will fatigue yourself and team. Fatigue is the worst plague in the world. All dislike it cordially, as they say a certain personage, "who shall be nameless in this polite assembly," hates holy water.

"6th. Weeds are the aboriginal occupants. Grow they will. To attempt to extirpate them is the SYSIPHIAN *labour* Grub, pluck, apparently destroy them; they come back, as if they knew by instinct you had no right to expel them You had better mind your business, and let them alone at once, and be done with it. You will save a deal of trouble

"7th. As to tools and instruments of husbandy, the *worse* the *better*; because the worst are the cheapest, and you will be least injured when they are broken, worn out, or lost. This must unavoidably happen. Every thing goes to decay, and must be renewed. Leave your implements and utensils for farming—such as ploughs, harrows, chains, hoes, axes, scythes, forks and rakes—where you leave off work. They will be ready for next year. That is economy of time. "Time is money;" Dr. Franklin says. So, you see, you save money.

"8th. When you borrow, never return the borrowed articles; they may be wanted again. Your neighbour can make a shift without them, or he would not have lent them. Besides, it takes time to carry them home. He has as much as you. If he does not come or send for them, they will be as useful to you as if they were your own

"9th. Never put back into its place a rail or a stone that has fallen from your fence. Ten to one, these, or others equally slippery or treacherous, will trouble you again by their falling. In all events, delay as long as possible. Parry *trouble.* Instead of *its* being repeated, make one job, when you can stave it off no longer. And supposing your neighbours' *creatures* eat your crop—it will do them some good, and save you the sweat of harvesting.

"10th. Never commence your farming business early; just as if you wouldn't find plenty to do, begin as late as you will. Farming is *hard work* for lazy folks: and *hard work* is not *easily* done—Let me *tell you that!*—as a sturdy beggar once told me.

"11th. In not changing seeds, and in sticking to the same crop on the same ground, without replenishing it with aliment to feed vegetation, follow your forefathers' wise example. Do you think yourselves wiser than they? Pretty story, truly! at this time of day! O, tempora! O, mores!—Oh, shame! where is thy blush!

"12th Do not put your meadows in too good heart. There will be no end of haying. To carry forage into the barn all summer, and to carry it out all winter, is a burden neither you nor your fathers' could bear.

"13th. Short pastures make fat sheep. Keep yours so, by hook or by crook. The shortest way is to overstock and impoverish your farm. Sheep know what is best. Other beasts have no business to complain, or know more than that most useful animal.

"14th. Keep the cheapest and least valuable breeds of cattle you can. The loss is less, if they die; and die they must, be they carnivorous, granivorous, or graminivorous. No matter what they eat. They are grass, for all flesh is grass; and grass is perishable, as all you, young gentlemen, who have studied chemisty, could doubtless demonstrate.

"15th. In feeding your cattle, I need not tell you the less you give them the cheaper you keep them; but one thing I must suggest, the more lavishly you deal out your fodder, the sooner the drudgery will be over.

"16th. Depend, without overseeing them, on the fidelity of your day labourers. There is an old story about hirelings. *Now*, as in days of *yore*, they wait for the sun to go down. Poor things! They wish to go home. Perfectly natural. It is a sign they are quite domestic; which, you know, is

an exceedingly good quality, in the family way.

"17th. If you must hire *steady* help, take the first *vagabond* you meet. It will be a cheap bargain, for probably he will go off unpaid, and only carry some trifles with him which you don't want very much; and will not miss until he is gone.

"18th. You should prove your *in-door economy* to be equal to *that without*, by adopting the proverbial system, of saving "at the spigot, whilst you let your liquor run profusely out at the bung." Seeing that wholesale is better than retail; and both together best of all.

"19th. Consult ease and convenience in the house, as well as out of doors. What a blessed thing to be, in all weathers, easy as an old shoe, as the saying is! Do not repair the breaches in the roof or sides of your dwelling, or your barn, in good weather. It would be a waste of the only season that is fit for field labours. In foul weather, you have a good excuse for not exposing your health. A leak may easily be stopped, by putting some good-for-nothing rags into it. When dried, they will be improved for the paper-maker, and may be sold at the tavern, for *rum, whiskey, flip* or *toddy*. No fear for rags; you are in a fair way to have enough more. Idleness is said to clothe a man with them. Worst come to worst, you must be badly off, if you cannot move your chair or your bed, to some spot where the rain will not *wet* you *much*, for one day or night. The storm cannot probably last but for some twenty-four hours. A mere trifle, compared to the whole year! You will *literally* obey the command, "to take no thought for the morrow," and so you will get along well enough. And it is strange if your cattle in the stable, should be more delicate than their owner, in his shed.

"20th. Live snug. Preserve the old habits, with which you are covered, as modern heroes are with glory. In good sooth, those who make such a pudder, and hue and cry after your *blue-laws* and *blue lights*, do sometimes twit you about your antique and steady habits. Now, I *count*, habits are commendable, or discommendable, only as they are good or bad. And, using my Yankee privilege, *I rather* GUESS your habits are *somewheres about* as good as those of your neighbours, who try to make game of you and jeer you so. And, as for that foul WITCH, INNOVATION, (worse than a Salem one,) since she broke loose from the bettering-house, where she made a pretty good servant, whilst kept *well under* by the good old *governess, mistress* REFORM; I *say, now*, this *ugly young* CREATURE is only busy in turning the world right upside down, under the modish name of IMPROVEMENT. Shun her as you would the gallows. However, when a change can be made, positively for the better, contrary to all prescriptive usages, I do not mean to tell you for *certain*, these *insututes* do absolutely prohibit it. In vain will some of you smooth-chinned *Tyros* call all this *stuff*, and some of it too whimsical and ridiculous to have been tried. You novices know nothing at all about it. We grey-beard *adepts* know better; since we have practised it ourselves. Truth is truth, and true it is, "*such things are*."

"Irony and levity apart—(*now put on your sober faces!*)—we hope *you*, or at least *some of you*, will become excellent farmers, and, by joining our society, make common cause. In serious earnest, we wish to *increase* our *number* of intelligent agriculturists, for on *that*, the success greatly depends."

"The general advises his auditors to insert their remarks, and the account of such improvements as they may make or suggest, in the "Almanacks" of the state; which may be very proper vehicles for the purpose; but the state of knowledge cannot be very high, where these are considered as the classical depositories for accounts of discoveries and improvements.

"It is much to be wished that some good elementary book on agriculture were published to give leading ideas on the subject to our practical farmers. Sir Humphrey Davy's work recommended by general Humphreys, is too theoretical and too scientific for the purpose: he takes for granted his own chemical theories, which the scientific world has not yet admitted, and he states, didactically, disputable numbers and propositions, unintelligible to any one but an adept in his own peculiar opinions.

"England undoubtedly stands at the head of all scientific and all practical agriculture. The improvements there in this science for the last half century —those we mean that have stood the test of practical and scientific investigation, are the following:

"1st. The system of farm-yard manure, wherein every decomposable matter, animal and vegetable, is stored to

be used on the fields in regular succession.

"2d. The modern practice of using all manures as recently as possible. Formerly they were heaped up and turned over at various times for a twelvemonth till the whole mass could be cut out like butter. It is now well understood that plants are nourished by the gases and juices formed during the gradual decomposition of the manure, all which are lost in the old plan.

"3d. The practice of farm-yard feeding, and sheep-folding connected with the turnip husbandry.

"4th. In the substitution of fallow crops for fallows, connected with the horse-hoeing husbandry. It is true, that fields are sometimes so foul with weeds that a fallow is necessary. In England, when a farmer is compelled to fallow a field, he lets the weeds grow into blossom and then turns them down: in America, a fallow means a field where the produce is a crop of weeds *running to seed*, instead of a crop of grain.

"5th. In the more spirited husbandry of turnips and potatoes for feeding cattle: and of carrots in sandy lands. A farmer in Lancashire will have no scruple in manuring for a potatoe crop at the rate of ten pounds sterling per acre. Ploughing up the potatoes, and then one ploughing for a wheat crop insures a profit.

"6th. In never permttting two grain crops to succeed each other. A fallow-crop (that is a horse-hoed crop) or a grass crop, always intervenes.

"7th. In selecting for pastures and meadows, those nutritive grasses that do not destroy each other, and that spring up at the same season. Curtis has done a great deal toward this; but his directions will not answer exactly for this climate: the principle, will.

"8th. In the great attention paid to agricultural machinery: to threshing-mills—to chaff-cutters—to drills and drill ploughs—to scarificators, &c. &c.

"9th. In England they understand the use of lime, and the mixing of sand with clay, and clay with sand, &c. better than we do. Their climate admits of the stimulating manure of Gypsum but partially: it is too moist.

"10th In this country we omit to cultivate plants of the most obvious profit. Madder, weld, poppies for oil, lavender, mint, &c. for essential oils. All these have been tried (even in Pennsylvania) with so much success on a small scale, that they well deserve trial on a larger.

"In this review, we have followed the example of the pamphlet under revision; we have preached a long sermon with little regard to the text, a practice not uncommon. General Humphreys has adopted for his motto, "from grave to gay, from lively to severe," which no doubt is intimately connected with the subject of agriculture.—C."

The following tract on agriculture is also by Mr. Cooper, the present editor of this Encyclopedia.

"Agriculture is the art of selecting and raising to the best advantage, those vegetable substances that serve for the use of man.

"It is not my intention to enter at large into the extensive theory of this first of arts, or to give a detailed account of practices adopted or recommended by the numerous writers on this prolific subject; but a few *general* observations hitherto seldom noticed in the connexion now presented to the reader may furnish more accurate ideas than commonly prevail.

"The theory of agriculture relates to 1st. the properties of the plant itself. 2d. of the climate and soil in which it is placed. 3d. The mode of accelerating its growth and increasing its size.

"Writers on agriculture, ignorant for the most part of the physiology of animals as well as vegetables, have usually considered and treated of plants as inanimate beings: they are not so.

"Every plant is the production of an organised seed endued with the property of vegetable life, and of being acted upon by appropriate stimuli. This vegetable life is originally excited and subsequently continued by the application of what may be called *natural* stimuli, much in the same manner as in animals. Thus the pollen of the pointal received by the chive, and thence propagated to the seed vessel, impregnates the seed, and excites the action of the living fibre, which afterwards proceeds according to the laws of organisation peculiar to each plant. This action is continually renewed by the application of vegetable food by means of which the germ is dilated till the plant arrives at its full growth. All this is perfectly analogous to the impregnation of the animal germ in the ovarium, and it subsequent growth to full age and size.

"In animals, the muscular fibres have the property of contracting on being irritated. *Irritability* as it is called. So have vegetable fibres. The sensitive plant, the hedasyrum, the

dionæa muscipula of Carolina, the phenomena of plants growing in a dark place and turning to the light, are proofs of this, if not of voluntarity. The separated twigs of hedasyrum, are irritable, like a separated muscle. Mr. Howard has lately discovered the same property in the pollen, on the application of alcohol. (Trans. Linn. Society of London.)

"Animals have feeling, perception, or *sensibility*, and the power of voluntary motion. So have plants.

"The facts adduced by Percival, Smith, and Darwin, and the whole class of phenomena relating to their search of food, and the propagation of their species seems to put this beyond reasonable doubt. To which may be added the habits and customs of the parasite plants.

"Animals, though perfect in all their parts, may be stinted in their growth by too small a quantity of food, and by other means; and this diminution will affect the size of their offspring. The case is precisely the same with plants. By plenty of food and favourable situations, animals may be increased in size. So may vegetables. By breeding from selected couples of a large size, the size of the animal offspring is increased. Hereon was founded the successful practice of the greatest cattle breeder in England, Mr Bakewell of Ditchley; and the same set of experiments has been repeated with equal success on plants by Mr. Cooper of New Jersey. Mr. Bakewell increased the flesh on particular bones of his cattle, and propagated this propensity. Mr. Cooper has in like manner propagated not merely increase of size, but increase of size in particular parts of the plant, and propensities to earlier vegetation.

"In animals, appetite may be provoked, and digestion assisted, by the artificial stimuli, of what physicians call *Condiments*, salt, pepper, wine, acids, bitters, &c. Such also is the property of vegetables. Their hands, mouth, and stomach, are in the soil; and by the application of artificial stimuli, such as lime, common salt, alkalies, plaister of Paris, &c. their roots may be excited to want, to seek, to take in, and to digest more nutriment than they would otherwise use.

"Animals may be surfeited with too much nourishment So a plant will die if set in a mere dung heap. Animals may be poisoned So may plants. Every metallic combination for instance, except oxygenated and carbonated iron, and calx of manganese (and lead?) in small quantities, being poisons to the vegetable.

"By the artificial stimuli of condiments, animals may be excited too much, and indirect debility will ensue. So is it with plants. In like manner, excess of these artificial stimuli will take away their beneficial effects, as half a pint of wine may assist, when a bottle will injure digestion. Thus, from the experiments of Sir John Pringle, and Dr Watson, (Bishop of Landaff) it appears that a small quantity of common salt is a septic to the animal fibre, and a manure to vegetables, while a large quantity, is the domestic antiseptic of cookery, and destroys vegetation altogether. So in the experiments of Judge Peters, two bushels of gypsum will produce a luxuriant crop; 6 or 8 will prevent it.

"In animals, when parts of muscular or other fibres, are weak, diseased and dying, artificial stimuli can be applied to excite an action in the living and healthy parts, by which the dead are separated and sloughed off. So in plants, the artificial stimulus of those substances which are not manures in the sense of affording nourishment to the plants, but only as exciting a stronger and more healthy action in the living fibre, will kill the weak and diseased roots, while they invigorate the more healthy. This is the mode of action (in part) of lime, gypsum, salt, &c. usually classed among manures, but which do not enter into the composition of the plant itself.

"Animals are resolveable into gases, lime and phosphoric acid. There is no peculiar animal earth. The phenomena of marine animals, the experiments of Vauquelin on the production of lime in the hen, and some other facts, make it probable, that the lime of the bones, as well as their phosphoric acid, is the product of animalisation.

"Vegetables are resolveable into gases and fixed alkali by fire: by putrefaction their alkali is either decomposed, or escapes, for no fixed alkali is found on the incineration of vegetables which have undergone completely the putrefactive process. Both vegetables and animals contain in their fluids accidentally, unessential quantities of iron, manganese, and neutral salts Thus the blood contains iron, albumen mucilage, the serum, urine, uric and phosphoric acids with bases of lime soda, volatile alkali. So in plants, r

tre is found in borrage, in nettles, &c. and oxalates in some. Hence it appears, that the essentially component parts of animals and vegetables consist chiefly of two or three gases.

"Again. Animal fibres are made from plants. So true is the scripture exclamation that all flesh is grass! An ox and a sheep are made up of vegetables, and so are we who devour them. Nothing is nourishment to an animal, but what was originally a vegetable. In like manner nothing is nourishment to a vegetable but what enters into the permanent composition of a vegetable. We find large plants grow in pure sand (Vanhelmont), in sand and clay, in common clay, in limestone, in limestone and sand, limestone and clay, and in all the combinations of these common earths, nay even in sulphur, in shot, in pounded glass, but we do not find that these earths or either of them, are any permanent and essential parts of the composition of a plant any more than of an animal. In a human body of 200 *lb.* weight, we may find about the fourth or fifth of an oz. of common salt, and we may *perhaps* find in clover the same proportion of gypsum, but these are accidental parts of the composition.

"More accurately. When a vegetable is decomposed by means of fire, in close vessels, we procure, 1st. a considerable quantity of water. 2dly. Pyroligneous acid or an empyreumatic vinegar. 3dly. On the top of these and mixed with them, is a quantity of strong oily matter that smells of tar and smoke. 4thly. a great quantity of carburetted hydrogen gas, to wit, about 50 quarts to the pound avoirdupoise of fine saw dust. All woods, and (I believe) all vegetables, furnish it in some proportion. 5thly. A 5th or 6th in weight of charcoal, and nearly equal in bulk to the vegetable itself; of this about 90 parts in 100 are frequently pure carbon, when well burnt and freshly made and weighed. 6thly. Alkali: inland plants furnish the alkali of potash; marine plants generally furnish the alkali of soda. The alkali of potash obtainable from the green woods usually employed for the purpose, does not exceed one part in 16 or 1800 parts. 7thly. Earthy salts and iron, in minute and accidental proportions.

"Now, The water is hydrogen and oxygen.
The pyroligneous vinegar, is carbon, hydrogen and oxygen.
The oily matter is carbon and hydrogen.
The carburetted hydrogen is carbon and hydrogen.
The charcoal is nearly pure carbon.
The alkali, is an oxyde of a metal.
The iron, or manganese may be accidental, but one or other is almost always found, though in minute proportions.

"Some vegetables, as the farinaceous that contain gluten, and the succulent tetradynamious plants that contain albuminous matter, furnish also azote. So do mushrooms, trufles, and morells, which on distillation give out volatile alkali, the base of which is azote. But the vegetables that furnish azote, are exceptions to a general rule. Lime also in very small quantities, is frequently found in vegetables, but nothing tends to induce us to regard it, as other than an accidental substance.

"The result is the same, when vegetable matter is decomposed in the moist way. Thus: let us take the case of a distillery, and consider the process that goes on there. The bruised grain is mixed with water: then yeast, (that is, carbonic acid gas enveloped in mucilage) is put to it. The gas acts upon the grain, and decomposition, and new compositions take place Great quantities of carbonic acid gas are evolved: alcohol is formed: then vinegar, which is alcohol united to oxygen. What do these products amount to, but carbon and hydrogen, and the oxygen imbibed from the atmosphere? For every drop of vinegar is made at the expense of a particle of alcohol united to a particle of oxygen.

"In the case of the decomposition of animal substances, whether in the dry, or the moist way, no acid appears: we get azote, a fetid animal oil, swimming at the top of a volatile alkaline liquor, and sometimes concrete volatile alkali, or carbonate of ammonia comes over The retort contains an animal charcoal, consisting of azote, carbon loosely combined, the base of the prussic acid, and if bones be used, phosphate of lime.

"In this case, the azote, the lime, and the phosphorus, seem to be new combinations, the result of animal organisation, modifying chemical affinity. There are many districts of Pennsylvania, perhaps the best pasture land in it, that do not contain a particle of limestone. Such for instance as a great

part of the county of Luzerne and the beech country comprehended between the north-east branch of Susquehanna, the New York state line, and the Delaware. There is no finer grass country; but limestone is rare throughout the greatest part of this space. A calf bred up there, will have *bones*, that is phosphate of lime: his flesh will yield *azote*, either by distillation, or by the nitric acid. Whence does he get it? The soil contains none; the grass on which he feeds contains none, but the ox is chiefly composed of azote and phosphate of lime!

"Hence it appears that about 99 parts out of a hundred of vegetable matter, consist of carbon and hydrogen, of which the carbon far exceeds in quantity."

"Hence also, the pabulum or food of vegetables, can only be carbon and hydrogen, or those substances which are easily decomposable into carbon and hydrogen.

"Hence animal matter is the best of manures, because, the carbon it contains is more easily disengaged, and the substance more easily decomposed than even putrescent vegetable matter. Hence it is that in steel furnaces and in case-hardening, animal charcoal is thought to aid the operation; the carbon of animal, being more easily separated, than the carbon of vegetable charcoal.

"Hence we learn to distinguish manures of *nourishment*, from manures of *stimulus*, and from *mechanical* manures; and we are taught that every vegetable and every animal substance when decomposed, furnishes pabulum to vegetables: and that every such substance so decomposed is a manure of nourishment, and that nothing else is or can be. It may be taken for an axiom, that from man to a cabbage or a lichen, nothing can be converted into nutriment for the living fibre, but what has been a permanently component part of living fibre before.

"Other properties of vegetables there are, *similar* (rather than analogous) to those of animals, which the necessary brevity of a short essay, will not permit to be detailed at length. It may be observed, however, that plants like animals may be transplanted from one climate and soil to another, provided the difference be not very great, and care be taken to accustom them gradually to the change. Indeed, vegetables like animals, will accustom *themselves* to the change in a generation or two, provided the difference be not above 8 or 10 degrees of latitude or of mean temperature. The range is not yet ascertained.

"On the preceding properties of vegetables, and their analogies to animals, may all the agricultural doctrine of manures be well founded. These analogies have been remarked by others, but their application in this respect has not been heretofore sufficiently observed.

"Animals *differ* from vegetables in having a more extended sphere of locomotion. The animal (cases nearly zoophytical, excepted) can move the whole of his body from one place to another—a plant can only move its root, fibres and its branches. The *convolvuli*, and other parasite plants, are in some degree exceptions; but the general rule is, that the immoveable centre of a plant's situation is the place where the germ falls, or the seed or plant is set with intent that it should remain. Hence the use of that kind of manuring which consists in the admixture of soils of various depths and adhesion, for the mechanical purpose of keeping the plant steady.

"II. Of the climate and soil.

"No experiments have been made to ascertain with precision the bounds of latitude or temperature which prohibit the naturalisation of exotic plants. In France, Young has marked the lines of the maize and the vine culture.—In this country maize grows tolerably well from latitude 42°, and beyond it to Georgia. Wheat is not so good and productive south of Virginia, as in the middle states. The latitudes of cotton and rice, are not yet exactly ascertained. Coffee has not yet had a fair trial in our southern states, nor the sugar cane. Much indeed yet remains to be done in this respect, and much is doing by the British government in the West Indies.

"Agriculturists have many vague denominations of soil, such as clay, loamy, marly, sandy, limestone, limestone gravel, sandy gravel, stoney, poor light soil, rich black soil. These are tolerably descriptive in a general way; but as the theory of the art improves, we shall need more accuracy. Of the primitive earths, none need be noticed under this section, but silex or sand; argil or clay: and calx or lime. The others have never been yet found in sufficient quantity to produce any notable effect, except in the hurtful quality of magnesia when combined with lime,

as 2 to 3 first noticed by Mr. TENNANT. It is evident that for the mechanical purpose of increasing or lessening adhesion, supporting the plant, and admitting its fibres to shoot more freely, clay, sand, and limestone are mutually manures to each other; acting mechanically by their mixture. Thus in Cheshire and Norfolk, in England, the clay and marl pits furnish an excellent and permanent manure to the sandy soil above; and assist moreover in retaining manure and imbibing moisture.

"But it is not merely the mechanical mixture of soils that may be useful; for the experiments of M. D'ARCET and M. FARONI have shewn us, that in the temperature of 100° of FAHR. different earths have different capacities for retaining moisture; so that by judicious admixtures, this valuable property in soils may be increased or diminished; and as none of the earths are found perfectly pure in soils, (clay, for instance, retaining 66 per cent. of sand without losing its distinctive character) a field is opened for ascertaining this property in different admixtures and combinations. For Mr. WEDGWOOD discovered that earths would chemically combine in the moist way

"Besides the tenacity of soils, and their capability of retaining moisture, their *depth* is also to be considered by the cultivator. Some plants have long tap-roots, such as rhubarb, liquorice, carrots, parsnips, madder, &c. These are evidently unfit for any soils, but of loose adhesion and of considerable depth. Equally preposterous would it be to use a soil like the Genesee flats, of 20 feet deep of light, rich mould, for grasses that spread upon the surface. Again, where soils are naturally sandy, dry, and arid, and the climate warm, plants should be selected, whose roots penetrate deep and beyond the influence of atmospheric evaporation. Thus, in this country as in the south of France. Lucerne, (*medica*) and chicory (*cichorium intubus*) would be luxuriant where no other grass would grow.

"III. I come now to consider the mode of accelerating the growth and increasing the size of plants.

"This is done by *manures* Hitherto, every substance added to soil or to the plant while growing, which effected, or was meant to effect these purposes, was called a manure. But, from what has been said, manure ought to be considered in at least four divisions. 1. Manures of nourishment. 2. Manures of stimulus. 3. Manures of moisture. 4. Mechanical manures.

"*Manures of nourishment.* Five different theories have been started on this subject, the pabulum of vegetables.

"1. Practical men have for ages discovered the use of dung in agriculture, and hence the common and oldest theory was, that the juices of decomposed animal and vegetable substances in the gross, were the chief pabulum of plants.

"2. VANHELMONT's experiment suggested *water* as the pabulum, but although some plants will live, none will flourish in mere water.—The French experiment of the decomposition of water, and the discovery of the excretion of oxygen, give countenance to the opinion that water, though not *the* pabulum, is decomposable, and is a pabulum; furnishing hydrogen: and it is also a component part of the plant even as water. The curious experiments of M. Braconnot add strength to this opinion. It is not yet known whether plants can decompose azote, but I am strongly inclined to suspect this substance to be a compound, for we have no fact to shew that animals absorb it from the atmosphere.

"3. Dr. HUNTER, of York, in his *Georgical Essays*, persuaded the world for some time, that oil was the pabulum of vegetables. But neither his theory nor his practice succeeded.

"4. Dr. PRIESTLEY, who had more right to form theories and conjectures than any man living, (because he furnished more facts of extensive application in chemical philosophy than any other man,) suggested that *phlogiston* was the pabulum. Some experiments of ARTHUR YOUNG, made in consequence of this supposition, tend to support it. But though in all probability *inflammable gas* may be converted into nutriment to vegetables, yet it is far from being true, that this is the only gas which can. The gases that escape from a dung-hill contain much carbon, azote, and ammonia, as well as various stimulating saline compounds. We know too, that electricity, and the galvanic fluid, seem to aid vegetation to a certain degree: but the action of these fluids is more satisfactorily accounted for, on the doctrine of stimulus, than of pabulum. That oxygen is not nutriment, is clear, from its being an excretion of plants in a healthy state, and in vigorous action, under the influence of the sun, as Dr. PRIESTLEY, and afte-

wards M. INGENHOUZ discovered. Hence, although fluid manures may contain the elements of phlogiston, or the combinations of phlogiston, this latter cannot of itself be taken as the only food of plants. Both plants and animals are resolvable into gases of which phlogiston may be a part, but there is something else which feeds and dilates the muscles of animals, and the leaves of trees, for they furnish something else.

"5. Dissatisfied with former theories, Mr. KIRWAN has proposed *carbon* or charcoal as the food of plants; and declares his opinion that if charcoal could be rendered soluble in water it would be the most efficacious manure. It is true, that charcoal and carburetted hydrogen are found in the incineration of all undecomposed vegetables, but they contain also alkali, oxygen, and nitrogen, &c.; nor is there any fact to prove that charcoal (or the oxyde of carbon) is either soluble in any liquid, or taken up as charcoal by any vegetable, or decomposed by any natural process: soot as a top dressing is a tolerable manure in England, but its use may be accounted for from the saline substances it contains. From every fact hitherto known, the pabulum of vegetables appears to be exhibited to plants generally in the form of a *liquid*. Hence, whatever theory of ingenious speculators be adopted as the simple and homogeneous pabulum of vegetable bodies in a living state, the old theory and the old practice must, and ought to prevail, namely, that the only manure of nourishment to be depended on, is dung, (i. e.) *decomposed animal and vegetable substances;* which contains within itself every substance that theory has hitherto assigned as the food of plants, ready to be afforded gradually, by the continual decomposition of the various compounds which the dung contains: and although it may be of use by dung-heaps to aid this decomposition, yet even in an undecomposed, or partially decomposed state, this gradual decomposition amounts in the end to the same thing. This is applicable to ground bone, woollen rags, horn shavings, &c. All the difference is, that *time is gained* by the artificial and complete decomposition of these substances.

"*Manures of stimulus.* Whatever accelerates the growth, or increases the size of plants, and does not actually enter into the composition and substance of the vegetable, can only be considered as a manure, by stimulating the healthy fibre of the plant, by destroying the dead and decaying fibres, and by assisting the decomposition of undecomposed animal and vegetable substances dispersed through the soil. It is thus that *gypsum* or plaister of Paris acts, being the most efficacious septic among the neutral saline substances. Of these manures of stimulus, none are as yet in common use, but lime, gypsum, and common salt.

"Lime, is limestone deprived of its water and carbonic acid amounting to 44 per cent. by fire. In this state, its stimulating powers are obviously much greater, than in its natural and neutral state of limestone. But even pounded limestone is a promoter of vegetation mechanically, on clayey and sandy lands; and this earth appears to be a specific stimulus to white clover, and perhaps to the potatoe. Hereto may be referred the rubbish of old buildings, and marl, which is clay about one half of limestone.

"Common salt. This, until the duty of two thousand per cent. in England, was a very common manure in Cheshire; the facts relating to it, in this point of view, are collected in WATSON'S *chemical essays*. In this country, Gypsum is much cheaper.

"*Gypsum*, plaister of Paris, *vitriolated lime*, or *sulphate* of lime. This has not been certainly found in any plant, but by M. MODEL, accidentally, in rhubarb. (*Journ. de phys.* vol. 6. p. 14.) even this I suspect to be a fallacy; for the characters of gypsum were not then well ascertained. About two bushels per acre to clover or corn seem to be a full quantity. It attracts the moisture from the air, and dissolves gradually when strewed on the ground. It is brought here from France and the bay of Fundy, and has also been lately found in New Hampshire, and on lake Erie. There is also some in Maryland on the Chesapeake, about one hundred miles below Baltimore, and throughout the Genesee country, and on the waters of the Chippawa. As it is not a component part of any plant, either in whole, or in its own component parts, it cannot act upon healthy vegetables, but as a stimulus, and upon diseased and dead ones, by its septic power. Experiments remain to be tried as to other manures of this description.

"*Gypsum* particularly deserves attention, considering that it has effected almost a complete revolution in the agriculture of Pennsylvania. Many

thousand acres of land, hitherto barren, have been converted into excellent pasture ground, by its surprising influence. Even the products of land, tolerably good, have been in some instances doubled by using it. The theory of its action was not understood. Judge PETERS of Philadelphia, who first collected the opinions of our farmers, on the subject of the gypsum as a manure, ventured to suggest, that the vitriolic acid was the fertilising principle of this manure: But Mr. Priestley of Northumberland, has given this opinion a fair trial, both by means of sulphur, and of sulphuric acid, in all proportions, without the slightest appearance of success. We shall have therefore as I think, to recur to the theory first advanced by myself in the year 1793, that it acts as a septic to dead fibres, and as a stimulus to living ones.

"*Manures of moisture and Mechanical manures.* Their action in giving *depth* by new addition; in giving *tenacity* by mixture, as clay with sand, or *vice versa*—in giving *capacity to retain moisture*, on the principles suggested by the experiments of FABRONI and D'ARCET, is too obvious to require further elucidation.

"Such are the ideas that occur to me as throwing some light on the theory of this complicated and most important subject, and suggesting the *rationale* of the application of manures, in cases not hitherto well understood. —T. C."

For an account of the different subjects connected with agriculture, we refer the reader to the articles, as they are classed in the order of the alphabet.

AGRIMONY, COMMON; or *Agrimonia Eupatoria*, L. It is represented in the 6th and 7th plates of CURTIS'S *Flora Londinensis*, p. 317.

In a medicinal view, the leaves of this vegetable are said to be aperient, detergent, and to strengthen the tone of the viscera; hence they have been used in laxity of the intestines, in scorbutic, and other disorders arising from debility. Digested in whey, agrimony affords a diet-drink grateful to the palate and stomach; though its leaves have an herbaceous and roughish taste, accompanied with an aromatic flavour. The leaves and stalks, together with the closed flowers, afford a dark yellow decoction, which, when previously impregnated with a diluted solution of bismuth, imparts a beautiful and permanent gold colour to animal wool. We state this fact upon the authority of M. DAMBOURNEY, who, in the year 1793, published a volume of "Facts and Experiments on genuine and permanent Colours," printed at Leipzig, in the German language.

The blossoms of the common agrimony have also been occasionally employed by tanners, for curing soft and delicate skins.

A. Eupatoria is a native of the United States. KALM says the Canadians use an infusion of the root in fevers with great success. Varieties of this species, are, *A. minor*, or White *A.*—*A. odorata*, or Sweet-scented *A.*—The *A. passiflora*, is also found in the United States.

Aggrostemma Githago, L. See CORN-COCKLE.

Agrostis Spicaventi, L. See SILKY BENT-GRASS.

AID-DE-CAMP, in military affairs, an officer employed to receive and carry the orders of a general. In the old military establishment of France, this name was applied to young volunteers, who attached themselves to general officers, to carry their orders wherever necessary, and principally during battle. The merit of an aid-de camp consists in apprehending, with the utmost clearness, the orders he receives, and delivering them with perfect exactness and precision.

AIR, in a pure state, is a colourless, transparent, compressible and elastic fluid; and one of the most important elements; whether we consider its application to purposes of general economy, or its effects on animated nature. It is the medium through which we breathe, and without which we cannot exist.

AIR, in natural philosophy and chemistry, a general term used to denote such invisible and exceedingly rare fluids as possess a very high degree of elasticity, and are not condensable to a visible fluid state by any degree of cold we are acquainted with. By this last circumstance air is distinguished from vapour, which is condensable by cold. This term was originally, and for a long time peculiarly, applied to the air of which the atmosphere is composed, and in this sense we shall here consider it. The different kinds of air, now comprehended under the general term gas, which the researches of chemistry have discovered, will be mentioned hereafter. See GAS, CHEMISTRY, and PNEUMATICS.

In diseases of the lungs, and epide-

mics arising from a confined or vitiated atmosphere, country air, in a pure state, has been attended with singular success; while, in such complaints, the most powerful remedies have been unable to compensate the want of this necessary article.

Air vitiated by the different processes of respiration, combustion, and putrefaction, or which is suffered to stagnate, becomes prejudicial to the human frame: hence large cities, public assemblies, hospitals, burying-grounds, &c. are injurious to health, and often productive of contagious disorders.

Plants and vegetables possess the wonderful property of restoring the purity of air. This, however, takes place only in the day-time, and when they are exposed to the light of the sun; for at night they rather corrupt the atmosphere.

Air which is rarefied, ascends. This is particularly exemplified in the periodical sea and land breezes of hot climates; where, in consequence of the reflection of the sun from the earth's unequal surface, the lower land air becomes highly rarefied, and rises into the upper atmosphere, while the sea air, being cool and dense, rushes in to supply its place. Upon this principle, M. VAN MARUM, a Dutch chemist, has discovered a method of purifying assembly rooms by a tin tube of nine inches diameter, and ten feet in length, to the lower surface of which lamps are suspended, for the purpose of rarefying the air, and urging it to ascend through the ceiling of the room.

Dr HALES has described the useful effects produced in French prisons, by long air trunks fixed through the ceilings of wards in gaols, to carry off the foul vapours which exhale from the prisoners: he declares that it has not only preserved many of their lives, but prevented them from communicating infectious distempers to persons assembled in the courts of judicature.

Noxious and mephitic vapours, arising from wells and other subterraneous places, may be effectually corrected by simple ventilation, or the admission of such portions of vital air, as will render the whole sufficiently respirable.

To ascertain whether the air of a mine, well, cellar, or large cask, be safe, a lighted candle suspended by a cord, ought to be conveyed to the bottom, before any person venture to approach it. Should a slight explosion take place, or the light burn dimly, or even be extinguished, the air is certainly noxious; but if the flame continue bright, no danger is to be apprehended. See WELL.

Artisans who are employed over *charcoal fire*, such as dyers, gilders, refiners of metals, &c. are exposed to considerable danger from the vitiated state of the air; to avert the injury to which their lungs are thus exposed, it would be advisable to be careful in having ventilation.

Likewise, in the construction of chemical laboratories, smelting mills, and similar offices, proper attention ought to be paid to their free and constant ventilation; as the metallic fumes, and other noxious vapours which they generate, are highly detrimental to health.

In chronic diseases, especially those of the lungs, a change of air is strongly recommended. It has sometimes, independently of any other circumstance, proved highly beneficial: inasmuch as patients have breathed more freely, even though removed to a damp and confined situation.

[The disinfecting mixture of GUYTON MORVEAU, which is oxymuriatic or chlorine gas, is certainly of great use where rooms are contaminated by infectious vapour or miasmata. Some common spirit of salt may be kept in one bottle, and some manganese in another: the manganese may be strewed on a plate or large saucer, and this may be placed over boiling water, a chafing dish of coals, or a small lamp; the spirit of salt may be poured on the manganese, when the chlorine gas will be extricated by the heat. It will be prudent to go out of the room and avoid the fumes, which bring on very obstinate coughing. After a short time, the room may be ventilated, and then washed, and whitewashed.—T. C.]

AIR, in the elegant fables of the Greeks, was personified under the names of Jupiter and Juno. Jupiter was said to reign in the upper atmosphere, and Juno in the lower. The air is sometimes, also, represented as a divinity, whose wife is the moon, and whose daughter the dew.

AIR, MANNERS. The *air* seems to be born with us; it strikes at first sight: *manners* are the result of education. A man pleases by his air; he distinguishes himself by his manners. The air prejudices; the manners engage. Such a one displeases and repulses you by his manners. He *gives* himself an air; he *affects* manners; he *composes* his air; he *studies* his manners.

AIR, in music, is properly the tune

which is adapted to the words of a song, or little piece of poetry intended to be sung; and, by the extension of the term, the song itself is called an *air*. In operas, the name of *air* is given to all measured music, to distinguish it from the recitative; and, generally, to every piece of music, whether vocal or instrumental, which has its beginning and end. If the subject is divided into two parts, it is called a *duo;* if into three, a *trio;* if into four, a *quartetto*, &c.

AIR-BATH, in its general acceptation, implies a contrivance for the reception of *fresh* air. All persons, but especially children, ought to resort, at least for a short time, *every day* to this method of enjoying the salubrious influence of that universal agent.

To persons of a robust and vigorous habit, we cannot recommend a more bracing and pleasant remedy. In this place, however, we shall give only an historical sketch of the simple air bath, without expatiating on its nature and effects. Its benefits were first pointed out by the late illustrious FRANKLIN, who describes it with his peculiar simplicity, in the following words: "Every morning at day-break I get out of bed, and pass half an hour, or an hour, in my chamber, according to the season, in writing or reading, without any clothes; and this seems rather pleasant than otherwise: and if I return to bed, as is sometimes the case, before I dress myself, I have an addition to my night's rest of one or two hours sleep, sweeter than you can imagine."

The late Lord MONBODDO, a man of an amiable, though eccentric character, was so decided an advocate for the air-bath that he accustomed himself to take violent exercise, when quite undressed, in the open air. In this practice he persevered till within a few years of his death, (which happened in May, 1799, at the age of 90.)

AIR-BLADDER, a kind of vesicula found in the bodies of fish, and denominated "the Sound," by means whereof they are enabled to sustain themselves in any depth of water, and either to rise or sink at pleasure. The air-bladder is the same with what is otherwise called the swimming-bladder; it lies close to the back-bone; and has a pretty strong muscular coat, whereby it can contract itself. By contracting this bag, and condensing the air within it, fish can make their bodies specifically heavier than water, and so readily fall to the bottom, whereas the muscular fibres ceasing to act, the air is again dilated, and they become specifically lighter than water, and so swim above. According to the different degrees of contraction and dilatation of this bladder, they can keep higher or lower in the water at pleasure.

AIR-GUN, a machine, the general form of which resembles a musket, and so contrived, that bullets are exploded from it, with great violence, by means of air. The force of air, however, is not so great as that of gunpowder. See PNEUMATICS.

AIR-JACKET, a dress made of leather, in which are contained several bags or bladders, composed of the same materials, and communicating with each other. These are filled with air blown through a leather tube, having a brass stop-cock, accurately ground at its extremity. In order to confine this elastic fluid, the jacket must previously be wetted; and thus the person is supported in the water without any effort, by the aid of these bladders placed near the breast. Those who are proficients in the art of swimming, condemn such artificial assistance as cannot always be readily procured: in our opinion, the most proper and easy method of acquiring this useful talent, is that mentioned by Dr. STRUVE, in his German treatise on the Physical Education of Children, lately published, with three Introductory Lectures by the late Editor of this Encyclopedia. See the article SWIMMING.

AIR-PIPES, an invention for drawing foul air out of ships, or any other close places, by means of fire made at the upper end of the pipe.

AIR PUMP. The name of this machine is sufficiently explanatory of its object. It is used in PNEUMATICS, which see; and by means of it, a vessel adapted to the experiment may be entirely exhausted of air.

AIR-SHAFTS, among minors, denote holes or shafts let down from the open air, to meet the *adits*, or shafts of entrance, and furnish fresh air.

AIR-THREADS, in natural history, the long filaments seen floating in the air at the autumnal season of the year. These threads are the work of spiders, especially of that species called the long-legged field-spider. This animal, having gained the summit of a bush or tree, darts from its tail several of these threads, till one is produced capable of supporting it in the air: and thus it mounts in quest of prey, and frequently rises to a very considerable height.

AIR-VESSELS, ducts in the leaves and other parts of plants, supposed to convey air to the vegetable system, as the lungs do to the animal.

Aix-la-Chapelle. See MINERAL WATERS.

AJUTAGE, or ADJUTAGE, in hydraulics, part of the apparatus of a jet d'eau, or artificial fountain; being a kind of tube fitted to the aperture or mouth of the cistern, or the pipe; through which the water is to be played in any direction, and in any shape or figure.

It is chiefly the diversity in the ajutage, that makes the different kinds of fountains. So that, by having several ajutages, to be applied occasionally, one fountain is made to have the effect of many.

It has been found that jets do not rise quite so high as the head of water; owing chiefly to the resistance of the air against it, and the pressure of the upper parts of the jet upon the lower: and for this reason it is, that if the direction of the ajutage be turned a very little from the perpendicular, it is found to spout rather higher than when the jet is exactly upright. It is found by experiment too, that the jet is higher or lower, according to the size of the ajutage: that a circular hole of about an inch and a quarter in diameter, jets highest; and that the farther from that size the worse. Experience also shews that the pipe leading to the ajutage should be much larger than it; and if the pipe be a long one, that it should be wider the farther it is from the ajutage.

ALABASTER, is a name sometimes given to white granular limestone, and sometimes to white gypsum.

ALARUM, a term employed to signify any instrument, or contrivance, for the purpose of awakening persons from sleep, at a certain hour, or of alarming them when exposed to danger. In the former sense, it is generally a part of clock work, and deserves here no farther notice; but in the latter, we strongly recommend the utility of alarums to every family, whether living in towns, or in solitary situations in the country.

Many ingenious suggestions have been devised, for affording security to the industrious, against the audacious attempts of house-breakers: the most common of these are, hanging bells to the windows, or larger bells and rattles kept in readiness for giving early notice to the watchman absent from his duty, or to the peaceful neighbour whose aid is required.

In the year 1771, Mr. HENRY invented a curious alarum, which was highly approved of by Sir JOHN FIELDING. All burglaries being perpetrated at night, this piece of mechanism deserves peculiar encouragement. On being fixed up, by a bell-hanger, with wires fastened up to the windows and doors, it will, upon the least attempt to break into the house, go off with a noise sufficient to awaken the family. As every clock-maker is acquainted with the construction of this alarum, we think it unnecessary to give a particular description.

ALBINO, the name given by the Portuguese to a white Moor; that is, one who is afflicted with the *nyctalopy* The term is sometimes applied to such Europeans, as have the same constitutional imperfections. See *Nyctalopy*.

ALBUMEN, properly signifies the white of an egg, but has lately been used in chemistry to denote likewise one of those elementary constituents of vegetable bodies, which, in its colour and properties, bears an exact resemblance to the animal substance known under this denomination.

The white of eggs if taken warm from the hen, especially in lukewarm milk, is uncommonly nourishing to the weak and infirm; but, when boiled hard, its nutritive quality is in a great measure destroyed, and it then becomes very difficult of digestion.

It is remarkable that, according to BOERHAAVE, the white of eggs was employed by the reputed PARACELSUS, as a menstruum of extraordinary properties; and which greatly contributed to his fame.—When boiled hard in the shell, and then suspended in the air by a thread, it dissolves, as is said, and drops down into a flavourless liquor; which, though destitute of acrid, oily, or saponaceous ingredients, makes a more perfect solution of myrrh than either water, oil, spirits, or even fire itself can effect.

In domestic economy, the white of eggs is usefully employed for clarifying ale, wine, &c. for which purpose it should be mixed with the liquor, and the whole boiled together; thus all the gross particles of the latter will subside, or be carried off with the former, which, by this process, is reduced to a concrete state, and is either precipitated, or combined with, the feculent ingredients of the liquid.

The *vegetable albumen* is one of those primary constituents of plants, which may be separated by chemical aid,

without undergoing any change of their native or inherent qualities. It is found principally in cresses, scurvy-grass, hemlock, and most abundantly in the anti-scorbutic and narcotic plants, where it generally resides in the leaves. Its existence may be easily discovered, by mixing the freshly expressed juice of these plants with spirits of wine, or by macerating them with hot water, nearly to the boiling point: in both cases, the albumen will be coagulated and separated from the other fluids in the form of cheesy matter. It is, perhaps, superfluous to observe, that this vegeto-animal production may in times of scarcity serve as a proper substitute for the white of eggs; it being possessed of similar properties. See the article Eggs.

ALBURNUM denotes the white soft substance that lies between the inner bark and the wood of trees, composed of layers of the former, which have not attained the solidity of the latter. A new layer of alburnum is added annually to the tree in every part, just under the bark, and the former layer of alburnum becomes perfect wood.

ALCARRAZAS. A kind of vessels used in Spain for cooling water intended for drinking. As they are exceedingly porous, the water oozes through them on all sides; the air which comes in contact with the water by making it evaporate, carries off the *caloric* or the principle of heat in the water in the vessel, and by these means renders it remarkably cool. The most celebrated place for this species of pottery is Anduxas in Andalusia. These vessels might be easily imported from Spain, and would be found of singular use in the United States.

[These wine coolers, Egyptian wine coolers as they are called, have been introduced here from England, but they are very inferior to ice and even to pump water. It is said the clay of which they are made, is mixed up with water containing salt, so that, as they are not burnt hard, they become more porous from the salt being soon washed out of them.—T. C.]

Alcea rosea, L. See Hollyhock and Paper.

Alchemilla vulgaris, L. See Common Ladies' Mantle.

ALCHEMY is the art of transmuting metals into gold, or changing the inferior into more precious ores. It was formerly much cultivated, and held in high estimation by fanatics, as well as by many learned but deluded men in latter times, however, it has been almost generally exploded, and is now pursued only by crafty impostors.

The ruin which frequently attended this popular delusion, became so extensive, that alchemy has, at various times, been proscribed in several states. The Romans banished such persons as professed it; and Dioclesian and Cæsar ordered all books on this subject to be publicly burned.

ALCOHOL, in chemistry, signifies spirit of wine, in a more ardent and purified state, obtained by distillation. Its specific gravity is to that of distilled water, as ·792 to ·1000.

[Mr. W Hembell, jun. of Philadelphia, obtained it of this strength ·792. I have obtained it of ·796 in the following manner. Make some carbonate of potash, (potash, pearl ash, or salt of tartar) red hot; break it quickly into small pieces, put it into common spirit of wine, and close the bottle. Add of this, till the carbonate of potash in the spirit of wine is no longer moist Add a small pinch of well burnt alum, which throws down any alkali that the spirit of wine may have dissolved: for although carbonate of potash is not, pure potash is soluble in spirit of wine. Pour off the clear liquor; distil it in a water bath at the heat of 185, so that the spirit of wine comes over in distinct drops and slowly. Put into the still or retort some fused muriate of lime, which will greatly assist in depriving it of water.

This alcohol dissolves instantly all the resins, even copal. It is highly evaporable, and therefore should be distilled in cold weather; and kept in a phial well stopped with a ground stopper, and secured by a little butter or hogs-lard in the crevice between the stopper and the phial.

Common alcohol may be made from the spirit of wine of the shops, by putting into it red hot carbonate of potash, and then adding a little well-burnt alum.

In England spirit of wine of ·825 is considered as alcohol. Proof spirit of that country is ·916.

Spirit of wine seems to be formed chiefly out of sugar by fermentation when the fermentation is permitted to go on, the alcohol combines with the oxygen of the atmosphere, and is converted into vinegar. Alcohol boils at 165° of Fah. When alcohol is mixed with water in whatever proportion, the specific gravity of the mixture, is different from the mean specific gravity of

the water and the alcohol before mixture. It is the proper solvent of all resinous substances; even of copal at ·796.—T. C.]

ALDERMAN, among our Saxon ancestors, was a degree of nobility, from which is derived the *earl* of the present day. Modern aldermen form the principal branch of a town or city corporation. Their number is not limited, but differs according to the magnitude of the place, where they exercise the authority of commissioners of the peace. In London, their number is twenty six; each having a ward, or district of the city committed to his more peculiar care; but, serving by rotation, as sitting magistrate for the whole. The office is for life, or for so long as the individual chooses to retain it. When a vacancy happens, through death or resignation, the livery of the ward are assembled, or, to use the peculiar term, a *ward-mote* is held; a new alderman is chosen, whom the lord mayor returns to the other aldermen, in the court of the lord mayor and aldermen, where the person so returned must be admitted, and sworn into the office, before he can act. If the person elected refuses to wear the gown, he is liable to a fine of 500*l*. Aldermen are exempted from inferior offices; from being put upon assizes; or from serving on juries. In the present day persons are not fined for refusing to take the gown; the honour is an object of great and anxious contest: but owing, it is supposed, to some recent failures in the city of London, it has been determined that no person shall be admitted to take the gown who cannot swear that he has property equal to 30,000*l*.

ALDER-TREE, or the *Betula Alnus*, of LINNÆUS, is so well known by the name of common birch, as to require no particular description. There are three species, 1. the *alba*, or common; 2. the *nana*, or dwarf; and 3. the *lenta*, or Canada-birch: the last of which grows to a height of upwards of sixty feet. The *alnus*, or alder-tree, is, properly speaking, another species of the Canada-birch. When suffered to grow in an open situation, it has an agreeable appearance. Whenever any soil is intended for pasture, the alder should by no means be encouraged, as it poisons the herbage, and renders the soil moist and rotten.

The *alba*, or common birch, is easily propagated; either from seeds or layers, and will flourish in most soils. While in the nursery, they should, in dry weather, be constantly weeded and watered. According to HANBURY, the best method of producing them, and preserving their varieties, is by distributing them in layers

The wood of this tree was, in ancient times, used for the construction of boats, and at present, on account of its hardness, is employed in the north of Europe for making carriages and wheels. In France, it is generally used for wooden shoes; and in England for women's shoe-heels, travelling boxes, &c.; it also affords very good fuel. In Sweden it is employed for covering houses, and is very durable. On deeply wounding, or boring the trunk of this tree, in the beginning of spring, a sweetish juice exudes in large quantities; and one branch alone will yield a gallon in a day. This juice is recommended in scorbutic disorders, and other impurities of the blood. Its most sensible effect is in promoting the urinary discharge. By proper fermentation, and with the addition of sugar, it makes a pleasant wine.—The plant itself is astringent, but the bark of the black berry-bearing alder, is affirmed to be the most certain purge for horned cattle.—The leaves, when eaten by cows, are said greatly to increase their milk.

There are several species of alder peculiar to the United States.

The bark is used by dyers, tanners, and leather dressers. It dyes a yellow; and with a little copperas, a yellowish grey, very useful in the demitints, and shadows of flesh in tapestry. The shoots cut in March will dye a cinnamon colour; and a fine tawny if they be dried and powdered. The fresh wood yields a dye the colour of rappee snuff The catkins dye green. The bark is also used as a basis for blacks; an ounce of it dried and powdered, boiled in three-quarters of a pint of water, with an equal quantity of logwood, with solution of copper, tin, and bismuth, six grains of each, and two drops of solution of sulphate of iron (copperas) will dye a strong deep *boue-de-Paris*, or Paris-mud. The leaves have been sometimes employed in tanning leather. The whole tree is very astringent.

The alder-tree thrives in swampy ground. The wood of this tree is in great esteem in Europe for machinery The cogs for mill wheels formed of it are deemed superior to any other. It is commonly used for bobbins. It resists wa[ter] powerfully, and hence is o[f]

value for pump trees, pipes, drains, conduits to reservoirs, piles under water, and all kinds of wood work, kept constantly wet. In Flanders and Holland it is raised for this purpose.

The alder is highly useful as a medicine. I have heard, says Dr. MEASE, of a well authenticated instance of the efficacy of an infusion of the catkins or candles taken internally, having effectually cured a boy of sore eyes, which apparently proceeded from a scrophulous cause, after a variety of remedies had been used without effect. A decoction of the barks of black alder and dogwood (*cornus florida*) is a common and successful remedy in the United States for intermittents. The roots of the *liriodendron tulipifera*, or tulip poplar tree, and of the sassafras (*laurus sassafras*) are sometimes joined with the alder and dogwood. Medical gentlemen who practise in the country would render a service to the public by stating the proportions of each remedy, which produce the best effect.

ALE, a fermented liquor, extracted from malt by the process of brewing. It differs from beer, in being paler, and having a less proportion of hops. This beverage was first made in Egypt, and used as a substitute in those climates which were unfavourable to the production of the grape. Among the Anglo-Saxons and Danes, it was a favourite drink, and they believed, that large and frequent potations of it constituted one of the chief enjoyments of those who were admitted into the Hall of Odin.

There are various kinds of ale, particularly the pale and brown; the former, being brewed from malt slightly roasted, is esteemed more glutinous and wholesome than the latter, which is made from malt of a drier nature. It may be prepared in various ways, from wheat, rye, millet, oats, barley, &c Its consumption in England, was, about twenty years ago, computed at the value of four millions sterling annually, including Great Britain and Ireland. See the articles BEER, and BREWING.

In cold countries, and to persons who take considerable exercise, ale may be of service, but in weak and lax habits, it is often attended with disagreeable effects, such as indigestion, flatulency, &c.

Various methods of *preserving* this valuable liquor from turning sour on long voyages, have been proposed; the [illegible] was first published by Dr STUBBS, in the 27th Number of the Philosophical Transactions. For its discovery we are indebted to an ale-seller at Deal, and it was tried with success in a voyage to Jamaica. "To every runlet of five gallons, after being placed in a cask on ship-board, not to be stirred any more, put in two new laid eggs whole, and let them lie in it; in a fortnight, or little more, the whole egg shells will be dissolved, and the eggs become like wind-eggs, inclosed only in a thin skin; after this, the white is preyed on, but the yolks are not touched or corrupted, by which means the ale was so well preserved, that it was found better at Jamaica than at Deal.

[Egg shells would answer a better purpose, for the use of them is to correct acidity. The yolks and whites will putrefy in common ale.—T. C.]

ALEXANDRIAN LIBRARY. This famous library was founded by Ptolemy Soter, for the use of an academy that he instituted in Alexandria; and, by continual additions by his successors, became at last the finest library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to seize all those which were brought into Egypt by Greeks or other foreigners. The books were transcribed in the museum by persons appointed for that purpose; the copies were then delivered to the proprietors, and the originals laid up in the library.

ALIMENT. By this term is understood the nutritive quality of such substances as are dissolved and mixed in the stomach, and converted into chyle, by the digestive process. It may be considered rather as the consequence of food taken by a healthy individual than as an article of food itself, for all kinds of animal and vegetable bodies do not furnish an alimentary supply, or at least, not in the same proportion.

Of those articles which afford it in the highest degree, animal food is the principal; being most easily digested, and furnishing a greater quantity of that milky fluid, called *chyle*. For this purpose, however, a due mixture of vegetables must be added, in order to correct its high luxuriance, and to render it more congenial to our nature.

Fresh air is one of those agents which are necessary to the digestion of food, and the consequent production of aliment; as, without a renewal of this salutary medium, the most wholesome

diet will be productive of but little benefit.

[Of the various articles of food, fat meat seems more nutritious than lean. All hunters and chain carriers in the woods, all poor labouring people prefer it. An Indian will travel for days together, with a handful or two of parched and ground Indian corn, and two or three mouthfuls of bear's oil in a day. Perhaps the following food will in the same weight, afford more nutriment to soldiers on a march than any other.

Breakfast.—4 oz. parched Indian corn, 1 oz. sugar; mixed up with water.
Dinner.—4 oz. parched Indian corn, 2 oz. fat salt pork.
Supper.—5 oz. parched Indian corn, 4 oz. fat salt pork.

Persons of bad digestion, should rather feed on animal than vegetable food, and rather on meats stewed, than roasted, broiled, or boiled. All burnt fat is acescent. Bear's meat seems the most nutritious of meats, if not more than a year old: next to bear's meat, pork. The Athletæ among the Greeks lived chiefly on pork. Arrow root, sago, tapioca, saloup, &c. have no pretensions to superior nutriment, or more easy digestibility. They admit indeed of being made palatable with sugar and lemon, but they are not so nutritive or so innocent as a piece of tender mutton, or beef-steak, where the stomach does not loathe animal food. Persons afflicted with acid indigestion, with gout or gravel, or diabetes, should abstain from much vegetable, and live chiefly on animal diet. The excretions of a healthy man with moderate exercise, amount to about 6 lbs. per day; whereof about 3 lbs. pass by urine, and about 2½ lbs. by insensible perspiration.—T C.]

ALGÆ in botany, an order of the cryptogamia class of plants. It is one of the seven families or natural tribes into which the vegetable kingdom is distributed. The plants belonging to this order have their root, leaf, and stem entire. Sea weeds and other aquatic plants are comprehended under this division.

ALGEBRA is a method of performing the calculation of all sorts of quantities by means of general signs or characters. At first, numbers and things were expressed by their names at full length, but afterwards these were abridged, and the initials of words were used in their stead: then the letters of the alphabet came to be employed as general representatives of any kinds of quantity. Hence algebra has been called "Specious Arithmetic," on account of the species of letters of the alphabet used: it is also called "Universal Arithmetic" from the manner in which it performs all arithmetical operations by general signs. All figures or arithmetical characters as 5, 7, 9, &c. have a determinate value, and always represent the same numbers, but algebraical characters are general and independent of any particular signification. The value of some quantities, in this science, are assumed as known, and others are supposed to be unknown. The known quantities are usually represented by the early letters in the alphabet, and the unknown ones by the final letters. Thus *a*, *b*, *c*, &c. are commonly put for known quantities, and *z*, *y*, *x*, &c. for unknown or indeterminate quantities: thus if $a+x$ be equal 9 and a is known to be equal to 4, then $x=9-4=5$. Again if $a+x=12$, and $a-x=8$, then by adding the two quantities together I get $2a=20$ (because there being $+x$ and $-x$ they destroy one another) and $a=\frac{20}{2}=10$, of course $x=2$. On such operations as these, extended almost indefinitely, algebra depends, and by them every problem in arithmetic, and almost all in geometry may be solved.

ALIBI, *elsewhere*, a Latin word, used, in criminal proceedings, to signify the absence of the accused with respect to the *place* where he is charged with having committed an offence:—thus, to allege and prove an *alibi*, is to protest and establish, by good testimony, that when the crime was committed, the party accused was in a different place from that in which it is said to have happened

ALIEN, in law, implies a person born in another country, and not naturalised in this.

ALIQUANT PART, in arithmetic, is that number which cannot measure any other exactly without some remainder. Thus, 7 is an aliquant part of 16; for twice 7 wants 2 of 16, and 3 times 7 exceeds 16 by 5.

ALIQUOT PART, is that part of a number or quantity which will exactly measure it without any remainder. Thus, 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c. All the aliquot parts of any number may be thus found: divide the given number by its least divisor, then divide the quotient also by its least divisor; and so on, always dividing the last quotient by its least divi-

sor, till the quotient 1 is obtained; and all the divisors, thus taken, are the prime aliquot parts of the given number.

Alisma Plantago, L. See GREATER WATER PLANTAIN

[ALKALIES possess the following properties: they have an acrid, caustic, urinous taste; they unite rapidly with all acids, destroying in them all acid character, and forming the class of salts termed neutral; they turn the red colour of most vegetables blue; and change blue vegetable colours to a greenish hue, and brown to yellow; they dissolve woollen, silk, hair, and all animal substances; they unite to oil and fat and form soap; they unite to siliceous earth and form glass. Alkalies are, 1st. Fixed alkalies which do not evaporate till a red heat be applied. Such are the alkalies of *potash* procured from the incineration of inland trees and plants; and of *soda* procured from the incineration of maritime plants, such as salsola soda, sea weed, &c. 2d. Volatile alkali, such as the alkali of ammonia procured by distilling animal substances, or sal ammoniac, and which is much more easily dissipated by heat than potash or soda. 3d. The alkaline earths, so called from their possessing most of the properties of alkalies: these are, lime, magnesia, strontia, baryta.

When deprived of carbonic acid, of water, and of oxygen, by means of a galvanic battery, of iron filings, or of charcoal, they put on a metalline lustre.

They are used for bleaching, for making glass, for making soap, for medicine.

In Pennsylvania, the farmers seldom save the ashes of the trees they burn in clearing the land. In New York state, a settler always counts upon paying the expense of clearing, by the field ashes, which are generally worth 12 cents a bushel at the nearest town: hearth ashes are worth 15 cents. A bushel of oak ashes will afford about 3 lbs. of potash, of hiccory about 5 lbs. Potash is made thus:

In large vats about 3 feet wide at top and 2 feet at bottom, having a false bottom about 6 inches from the true bottom, the false bottom bored full of holes, clean sticks are put; on these a layer of straw, on this 4 inches of good slacked lime, then 12 inches of ashes, then 4 inches of lime, and so on. Water is poured on the ashes till it comes away nearly tasteless; it is then evaporated in large iron boilers till it becomes solid; it is then dug out with iron crow bars, and barrelled up. It is coloured by unburnt charcoal.

When it is again fused in a reverberatory furnace to burn away all the coaly matter it becomes *pearl ash*.

American potash contains about 850 lbs. of potash in 1000 lbs. weight of the saleable article.

The alkali of *soda* is usually purchased under the names of alicant barilla, or kelp, or black ashes: which are the rough mass obtained by burning sea plants; and are very impure.

A factitious kind of barilla is made by decomposing common salt, and Glauber's salt, by means of chalk, charcoal, and iron. This is also sold under the name of black ashes.

A much purer kind of soda is procured, by grinding one part by weight of common salt, and four parts of litharge together, with water enough to make them into a paste. This is Mr. Turner's patent method.

Soda is also found native in Egypt, in Persia, in the East Indies. The *volatile* alkali is procured either by distilling bones, horns, hoofs, and parings of skins; or for finer purposes, by decomposing sal ammoniac by means of quick lime.

When alkalies contain carbonic acid, they are said to be mild; when deprived of carbonic acid by means of lime, they are said to be caustic.

The best mode of taking alkali as a medicine for the gravel or stone is in the form of Castile soap; one ounce of soap contains one drachm of pure alkali, equal to 300 grains of common transparent crystallised carbonate of soda: for 100 parts of this last salt contains 20 of alkali, 16 of carbonic acid, and 64 of water, according to Bergman; or alkalies may be taken in seltzer water. Alkali and magnesia are the medicines most extensively useful in gout, gravel, heart-burn, and general indigestion.

Latterly, some new alkalies have been found, as the lithern in a mineral: and an alkali of a new character in the analysis of nux vomica.—T. C.]

Alkaline Earths, are those which partake of the nature both of earths and alkalies; or, in other words, those earths which agree with alkalies in being soluble in water, to a certain extent, and thereby rendering it sapid, in the property of changing to green, certain blue and red vegetable colours; of absorbing carbonic acid with eager-

ness; and of possessing, when pure, those caustic or acrid qualities that so much distinguish the alkalies. These earths are barytes, magnesia, lime, and strontian; whose saline properties generally predominate over their earthy ones.

ALKANET, EVERGREEN, or Bugloss; the *Anchusa sempervirens*, L. of eight species, the only one which is indigenous; it is represented in SOWERBY's *Eng. Bot.* 45, p. 5—7.

The *Anchusa officinalis*, or greater garden-bugloss, is a native of the warmer parts of Europe; but will also thrive in Britain. The flowers of this species, which blow during the whole summer, have obtained the name of cordial flowers, as they moderately cool and soften the palate and stomach. They are much visited by bees—the young leaves afford a good substitute for early garden vegetables, and the whole plant is an excellent fodder for cattle. If the juice of the fresh flowers be boiled with a solution of alum, it yields a green colour, as is said.

The *Anchusa lutea*, or *Onosma echioides*, L. is a native of France, Italy, Switzerland, Austria, and some parts of Russia. Its perennial and woody root is, as it were, externally varnished with a beautiful carmine colour; hence the females of the last mentioned country steep it in oil, for the vain purpose of painting their faces.

Another species, the *Anchusa tinctoria*, L is imported from the Levant, but unprincipled dealers frequently dye the common garden-bugloss in a decoction of Brazil wood, and substitute it for the genuine root, which, as obtained from Montpellier, is of a woody texture, externally blood-red, but internally white, without flavour, and of an acrid taste. DODONÆUS affirms that, when transplanted to a cold climate, it loses its red colour.

The Spanish Wool, or *Charta Hispanica*, is said to be prepared of this root: and RUGER, a late German writer, gives, in his "Pocket Book for Painters," the following directions for obtaining from it a beautiful *purple lacker*: take two ounces of the root finely powdered, and boil it for a few minutes in a lixivium made of potash sufficiently diluted: and after the liquor has grown cold, precipitate the colouring matter with a strong solution of roach-alum. The precipitate thus obtained must not be edulcorated or washed with water, as is done in similar processes; because this ablution would carry off too many of the colouring particles.

All the species of *Anchusa* may be propagated by seeds, which should be sown either in the spring or autumn, upon a bed of light sandy earth; and when the plants are strong enough to be removed, they should be planted in beds two feet distant from each other, and watered, if the season require it, till they have taken root. The alkanet reared in this country, is greatly inferior to that which is imported from the Levant.

[Alkanet gives a red colour to alcohol and to oils, but not to water. It is used with oil for mahogany furniture.—T. C.]

[ALLEGIANCE. *Ligeantia*. Is the obligation that a subject is under to obey his sovereign according to the laws and constitution of the country. This at least is its meaning in Europe generally. In England, allegiance is held as a branch of the feudal system to be due to the *person*, (not to the office) of the monarch. Throughout Europe the law is, that a subject cannot put off his allegiance; it remains a tie upon him and his children, irremoveable. Among the ancients, the law was various in various places. For the most part, a man might remove from one city, and become the citizen of another.

In this country, the case of captain Js. Williams, decided by Judge Elsworth, seems to establish the doctrine, that until congress shall provide some form of putting off allegiance to the United States, no individual can do it of his own authority. It is a contract indissoluble by one of the parties without consent of the other. Some cases in Cranch's Reports, comprise arguments on the subject, but no decision. —T. C.]

ALLEGORY, a figure of rhetoric, in which, terms are employed that, taken in their literal sense, signify something very different from what is intended, but which bears an allegorical resemblance. The allegory is a continued simile; it is a picture that is intended to attract by the objects it presents, and instruct by its obvious meaning. Allegory is fable. Thus, orators and poets have represented a state under the figure of a vessel, and the troubles that agitate it under those of unruly winds and waves; by pilots they mean sovereigns and magistrates: and by a haven, peace or concord.

ALLEGRO, in musical composition,

points out the third of the four principal degrees of time, as established in Italian music. *Allégro* is an Italian adjective, signifying gay, and also expressing a gay and animated movement.

ALLIGATION, a rule of arithmetic, which resolves questions that relate to the compounding or mixing together divers simples or ingredients. There are two kinds of alligation, medial and alternate. The *former* is the method of finding the rate or quality of the composition, from having the given rates and quantities of the ingredients. The *latter* is the method of finding the quantities of ingredients necessary to form a compound of a given rate.

ALLITERATION, a figure in poetry, which consists in the repetition of the same letter. Tastefully used, it is a most enchanting ornament. It will equally contribute to softness, to energy, and to solemnity. The reason of this effect, and of its adversity is, that each letter of the alphabet has a peculiar character: thus the R will generally be found to begin words that imply *violence;* or, by metaphor, something that does violence to the imagination: as *r*end, *r*oar, *r*ugged; the S, such as have a reference to quiet: as *s*till, *s*tand, *s*tone. The following examples will explain what is called alliteration, and show, so far as they go, its influence on the expression:

> "*F*ields ever *f*resh, and *g*roves for ever *g*reen."
> "*R*uin seize thee, *r*uthless king."
> "To *h*igh-born *H*oel's *h*arp, or soft *L*lewe*ll*yn's *l*ay"
> "Stamp we our vengeance *d*eep, and ratify his *d*oom."
> "*A*nd *a*pt *a*lliteration's *a*rtful *a*id."
> (*Churchill.*)

ALLODIAL *lands*, are those which, under the feudal system, were free. Their owners owed no service to a superior lord.

ALLOY, or ALLAY, a proportion of a baser metal, mixed with a finer one. Silver and gold are alloyed, in order to render them of such a degree of hardness, free from brittleness, as will fit them for use. The principal reasons alleged for alloying national coin are these: 1. The natural mixture of metals, which, when melted from the mine, are not perfectly pure. 2. The saving the expense that must ensue if they were to be refined. 3. The necessity of rendering them hard, by mixing some parts of other metals with them to prevent the diminution of weight in passing from hand to hand. 4. The melting of foreign gold or coin, that is alloyed. 5. The charges of coinage, which must be made good by the profit arising from the money coined. 6. The duty belonging to the sovereign, on account of the power he has of causing money to be coined in his dominions. Many alloys of metals are used in our manufactures, of these the most useful are brass, type-metal, tutenag, bronze and speculum metal. When two metals are fused together and produce a mass whose specific gravity is greater or less than the mean specific gravity of its elements, the result is an alloy, or proper chemical combination. Combinations of this kind are more fusible than the metals of which they are formed. Thus, an alloy of tin, bismuth, and lead, in certain proportions will melt in boiling water, which is a less heat than is necessary for the liquefaction of bismuth, the most fusible of the three.

ALLSPICE, *Pimento,* or Jamaica pepper. The berry, in its smell, resembles a mixture of cinnamon, nutmegs, and cloves, whence it has derived its name. It is milder than the East India pepper, and, when employed in whole grains, makes an useful ingredient in broth, and stewed dishes. In medicine, it forms the basis of a distilled water, a spirit and an essential oil; in which different forms it is efficaciously employed as an aromatic, for cold and phlegmatic habits. See the article SPICES.

ALLUVIAL. This is a term used by mineralogical and geological writers, and by alluvial depositions is meant the soil which has been formed by the destruction of mountains, and the washing down of their particles by torrents of water. The alluvial formations constitute the great mass of the earth's surface. They have been formed by the gradual action of water upon other formations. See MINERALOGY.

ALMANACK, a term derived from two Arabic words, *al* and *manack*, a diary; and is, as its name imports, a table or register containing a calendar of days and months, the rising and setting of the sun, the age of the moon and the eclipses of these luminaries. It is also used to foretel the change of seasons, the state of the weather, the ebb and flow of the tide, &c.

It is, therefore, sincerely to be wished, that such publications as are addressed immediately to the bulk of the

people, may in future be rendered the vehicles of more useful information. Hence we presume to remark, that an annual publication, conducted upon the plan of *Poor Richard's Almanack*, in Pennsylvania, would be attended with great advantages, both to the husbandman and mechanic, in this country. The great FRANKLIN, who is said to have edited that popular work for many years, furnished it with various sentences and proverbs, principally relating to subjects of industry, domestic economy, and frugality.

Almanack, an astronomical table of the days of the year, with the addition of various civil particulars. The name and plan of this yearly work, and particularly the astrological part, which still disgraces a very popular almanack of our own age, is borrowed from the Arabs: but Regiomontanus, or, John Muller, of Monteragio, who flourished at Nürnberg, in the latter part of the fifteenth century, was the first that reduced it into the present method. His first almanack was published in 1474.

Nautical Almanack, and *Astronomical Ephemeris*, a kind of national almanack, published by anticipation for several years before-hand, for the convenience of ships going out upon long voyages; it is adapted to the first meridian, and contains, besides many particulars common to other almanacks, the sun's longitude, right ascension, declination: the planet's longitudes, latitudes, times of passing the meridian; the times of solar and lunar eclipses, together with those of Jupiter's satellites; the distances of the moon from the sun, and certain fixed stars; and, in general, the times when any remarkable celestial appearances may be seen at the place for which the ephemeris is calculated.

ALMOND, a tree, eminent both for its fruit, and for the ornament which it affords to a shrubbery. It is the original of the ancient genus *amygdalus*, and by the botanic characters of the flowers comprehends also the peach and nectarine Botanists admit but of one real species of the common almond tree, which they term *Amygdalus communis*. Not being indigenous, we shall omit its particular description, and proceed to state the properties and effects of its fruit on the human body.

Sweet almonds are supposed to afford but little nourishment, and are not easily digested, unless thoroughly triturated In medicine, they are chiefly used for preparing emulsions, as they abound not only with an oil, but likewise with a mucilage fit for incorporating oil and water. We have already observed that this fruit is difficult of digestion, on account of the oil it contains, which quickly becomes acrid in the stomach; hence it is particularly improper for bilious constitutions The various preparations of almonds are liable to similar objections: and it is therefore absurd to give almond milk as a common diet-drink to febrile patients: for, as it consists entirely of oily and insoluble parts, it not only heats and vitiates the stomach, but at the same time occasions an accumulation of bile.

Almonds, as well as nuts, ought to be eaten only while fresh, and blanched, without their skins. They should be well chewed; for every piece swallowed entire is indigestible. The use of a little salt, however, renders them miscible with our fluids, as a saponaceous mass; but if indulged in to excess, they are productive of alarming, and sometimes fatal disorders.

Bitter almonds are now generally disused. They have been found to destroy some kind of animals; hence modern physicians prescribe them with more caution; they are nevertheless, frequently employed, for making orgeat and other liquors, without producing and bad effect, in small quantity.

Although we have declined to give a particular description of the Almond tree, yet as it is frequently cultivated in shrubberies, both on account of its beautiful flowers, and also for its fruit, we shall here add an outline of the manner in which it should be managed.

Almonds are propagated by INOCULATION, or *budding* on plum or peach stocks, in the month of August, at such height as may correspond to that of the stem intended to be raised · at the expiration of two years, the trees may be finally planted out If the soil be dry, this operation should be performed in October, when the leaves begin to decay; but, in case the ground be wet, the proper season is the month of February.

When the young trees are removed from the nursery, Mr FORSYTH is of opinion, that they should never be cut, or pruned, "till the new shoots begin to break," and as these frequently perish during severe winters, that succeed wet autumns, when the wood is not well ripened, he directs them to be cut down to the sound wood; care be-

ing taken to extirpate with the knife all cross shoots, so as to make the tree open in the middle, and to leave the principal shoots, according to their strength, from six to sixteen inches long. Those parts, which are affected with the CANKER, must also be cut out; and such excision ought farther to be extended to all decayed wood.

Almond trees being very delicate, it will be advisable to place them in a southern aspect, and in a sheltered situation, either among tall flowering shrubs, or to thatch their tops with fern, or other light covering; in order to prevent the blossoms from being killed by the frost, during the months of February and March. When the fruit is *set*, and the leaves are sufficiently long to cover it, such shelter ought if the weather be warm, to be removed, towards the end of April, or early in May; by which expedient an abundant supply of almonds may be obtained for the dessert both in autumn and in the winter. The fruit of the almond tree is chiefly valued on account of its kernels; it may be preserved either in dry bran, or in sand; but it ought previously to be dried, on shelves or boards in an open situation; as it is otherwise apt to become mouldy, and consequently the kernels will be unfit for use.

ALMS HOUSES are asylums for the support and maintenance of a certain number of poor, aged, or infirm persons, during their lives. When these institutions are of a *private* nature, and limited in their extent, they are certainly beneficial to society, yet it may on the whole be doubted, whether such *public* establishments do not in a great measure tend to relax the springs of industry, and encourage habits of indolence. For, by accustoming people rather to resort to eleemosynary sources, than exert their own strength and abilities, they cannot fail to degrade the moral feelings of human nature, and to destroy that independence which constitutes its noblest support. See the articles CHARITY and HOSPITALS

ALOE is a beautiful exotic plant, the flowers of which grow in umbels on the tops of the stalks, are of an elegant red colour, and appear in the months of August and September. It consists of ten species, all of which are propagated either by off-sets, or by planting the leaves. The proper earth for this vegetable, is one-half of garden-mould, or fresh earth dug from a common; the other half consists of an equal proportion of white sea-sand, and sifted lime-rubbish. This mixture should be made at least six or eight months previous to its use. The common aloe will live in a dry green-house in winter, and in summer may be placed under shelter, in the open air; but should have very little water, and none on the stem of the plant; the other species require to be kept in an airy green-house, in which there is a stove to make a fire in cold weather.

Among the Mahometans, and especially in Egypt, the aloe is held in high estimation, and even dedicated to religious offices. These superstitious people believe, that it prevents evil spirits from entering their houses: for this purpose, both Christians and Jews place it over their doors; and whoever returns from a pilgrimage, exhibits it as an emblem of his having performed that journey.

Its properties are various; and applied to numerous purposes, both medicinal and domestic. The leaves of the Guinea-aloe, as described by M. ADANSON, in his voyage to Senegal, are employed in making very good ropes, not liable to rot in the winter.

Dr. SLOANE describes two sorts of aloe, one of which is used for fishing lines, bow-strings, stockings, and hammocks; the other produces leaves capable of holding rain water.

In Mexico there is a species of aloe called the *Maguei*, which is applied to almost every purpose of life. Besides making excellent hedges and inclosures for their farms, its trunk serves as beams for the roofs of their houses, and its leaves instead of tiles. From this plant, the natives make their paper, thread, needles, and various articles of clothing, and cordage; while, from its copious juice, they extract wine, honey, sugar and vinegar. Of the trunk, and thickest part of the leaves, when baked, they prepare an excellent dish. It is likewise employed by them in several diseases, but especially in those of the urinary passages.

In this country, aloe is principally known as a medicine in the form of an inspissated juice, which consists of three sorts: 1. the *Aloe perfoliata*, or Socotrine Aloe; 2. the *Hepatica*, Barbadoes, or Common; and 3. the *Caballina*, Fetid or Horse Aloe. The first of these is the purest, and is brought from the island of Socotora, wrapt in skins It is of a glossy surface, and in some degree pellucid, of a yellowish red colour, with a purple cast, and when re-

duced to powder, of a bright golden shade. In winter, it is hard and friable, but in summer pliable, and grows soft, when pressed between the fingers. Its taste is bitter, accompanied with an aromatic flavour; the smell is not unpleasant, and slightly resembles that of myrrh.

Aloe is considered as a good opening medicine for persons of a lax habit, and those whose stomach and bowels are loaded with phlegm or mucus, and also for worms; because, while it carries off viscid humours, it serves by its stimulating qualities to strengthen and brace the system. When given in small doses of a few grains, repeated at intervals, it not only cleanses the alimentary canal, but tends also to promote the menstrual discharge in women: hence, its use in the green sickness, and all female obstructions. We must, however, observe, that, though it be a good stomachic laxative, it ought to be employed with great precaution, being an acrid and heating medicine, and therefore not proper in bilious complaints, or in a febrile state of the body. Its continued use sometimes produces the piles and habitual costiveness. When given in substance, without any mixture, it frequently adheres to the coats of the intestines, where it occasions griping and uneasiness: for which reasons, and in order to destroy its viscid properties, it should be previously combined with some saponaceous or resolvent medicine, such as a small quantity of alkaline salts, the yolk of an egg, Castile soap, or mucilaginous vegetable extracts.

With respect to the economical purposes to which the aloe may be rendered subservient, we shall relate only the principal.

It is asserted by an anonymous writer, in the *Gentleman's Magazine* for July, 1754, that a varnish made of the extract of the hepatic aloe, turpentine, tallow, and white lead, or Spanish brown, when applied to the bottoms of ships, is the most effectual means of preserving them from the *sea-worm*: the discoverer remarks, that a plank covered with this mixture, was sunk with a proper weight and ropes, together with another in an unprepared state, both in an equal depth of salt water, where the worm abounded; and, upon raising them, after they had remained there from 5 to 8 months, the former was perfectly sound and untouched, while the latter was eaten to a honeycomb. This hint was adopted by a gentleman at Bermudas, who observed the inhabitants employ a few sliced leaves of the plants, from which the hepatic aloe is extracted, in addition to the oil and tallow, which are boiled together and used in careening their fishing-boats.

Another valuable property of the horse-aloe, beside its being an excellent purgative for horses, is its bitter principle, which renders it eminently useful in watery solutions, not only for preserving tender plants from the depredations of vermin and insects, but likewise for preventing putrefaction in certain vegetable and animal bodies, such as dried plants, stuffed birds, quadrupeds, &c. Proper care, however, should be taken, that solutions or mixtures made with aloe be not exposed to be swallowed by dogs, cats, or other domestic animals, as to them the consequences would be fatal.

Several species of this useful plant have also been employed for manufacing a *cloth*, resembling linen in its texture, and *paper* of various qualities. CLUSIUS made shirts of it at Madrid, and BOURGOING, in his travels through Spain, informs us, that the natives of that country, manufacture their horse-bridles from the filaments of aloe-leaves. MINASI, an Italian, produced from similar materials, different kinds of coarse and fine paper.

Lastly, we find, in the "*Experiments and Observations*," published by POERNER, a credible German writer, in 1772, that a watery decoction made of the resinous gum of the aloe, without any further addition, produces a beautiful dark cherry-brown colour on woollen cloth, by simple immersion. This fact may be easily ascertained by dyers.

According to M FABRONI, the leaves of the Socotrine aloe afford a beautiful *violet* colour, which resists the action of oxygen, acids, and alkalies He directs the juice to be extracted from the fresh leaves, and then exposed to the air: thus, the liquid will become gradually red, and at length be converted into a deep violet purple which is peculiarly calculated for dyeing silk, a stuff that readily imbibes the colour without any aid of mordants. M. F. observes, that such juice may also be inspissated; in which state it forms a beautiful transparent colour for painting in miniature.

Alopecurus pratensis, L. See MEADOW FOX-TAIL

Alopecurus agrestis, L. See SLENDER FOX-TAIL.

ALPHABET, the natural or customary series of the several letters of a language The word is formed from *alpha* and *beta*, the first and second letters of the Greek alphabet The number of letters is different in the alphabets of different languages The English alphabet contains 24 letters, to which if we add *j* and *v* consonant, the sum will be 26, the French contains 23, the Hebrew, Chaldee, Syriac, and Samaritan, 22 each, the Arabic 28, the Persian 31, the Turkish 33, the Georgian 36, the Coptic 32, the Muscovite 43, the Greek 24, the Latin 22, the Sclavonic 27 the Dutch 26, the Spanish 27, the Italian 20, the Shanscrit 50, the Ethiopic and Tartarian, each 202, the Indians of Bengal 21, the Baramese 19 The Chinese have, properly speaking, no alphabet, except we call their whole language by that name, their letters are words, or rather hieroglyphics, amounting to about 80,000

Alsine media, L. See COMMON CHICKWEED

ALTERNATION, or *Permutation*, of quantities or things, is the varying the order or position of them

Thus two things, or quantities, *a* and *b*, may either of them stand first, as *a b*, or *b a*, making $1\times2=2$, alternations A third thing may stand three different ways relatively to either of the positions *a b* or *b a*, of the other two, for it may stand either before, or between, or after them, thus making $1\times2\times3=6$, the changes of three things In like manner, it will appear that with four things there may be four times as many changes as with three, making $1\times2\times3\times4=24$ And so on, always multiplying the last found number of alternations, by the ordinal number of the next thing added For example, the number of changes which may be rung on twelve bells, will be expressed by the product of $1\times2\times3\times4\times5\times6\times7\times8\times9\times10\times11\times12=479{,}001\,600$

Althæa officinalis, L See MARSHMALLOW

ALTITUDE, in geometry, is the third dimension of body considered with respect to its elevation above the ground and is otherwise called its height or depth, the former, when measured from bottom to top, the latter when measured from top to bottom

Altitude of a figure, is the distance of its vertex from the base, or the length of a perpendicular let fall from its vertex to the base The altitudes of figures are useful in computing the areas or solidities

Altitude or height of any point of a terrestrial object, is the perpendicular let fall from that point to the plane of the horizon Altitudes are distinguished into accessible and inaccessible

Altitude, Accessible, of an object, is that to whose base there is access, to measure the nearest distance to it on the ground, from any place.

Altitude, Inaccessible, of an object, is that to whose base there is not free access, by which a distance may be measured to it, by reason of some impediment, such as water, wood, or the like.

To measure or take Altitudes If an altitude cannot be measured by stretching a string from top to bottom, which is the direct and most accurate way, then some indirect way is used, by actually measuring some other line or distance which may serve as a basis, in conjunction with some angles, or other proportional lines, either to compute, or geometrically determine, the altitude of the object sought

There are various ways of measuring altitudes, or depths, by means of different instruments, and by shadows or reflected images, on optical principles. There are also various ways of computing the altitude in numbers, from the measurements taken as above, either by geometrical construction, or trigonometrical calculation, or by simple numeral computation from the property of parallel lines, &c.

The instruments mostly used in measuring altitudes, are the quadrant, theodolite, geometrical square, line of shadows, &c

ALUM is a concrete salt, transparent, and of a very austere and astringent taste It is in general a chemical preparation, being rarely found free from other ingredients In Egypt, Sardinia, Spain, Bohemia, &c it is said to be sometimes discovered in crystals

[Alum, is made either by grinding and lixiviating the slaty clay that naturally contains it, or, as in France, directly by boiling tobacco pipe clay in sulphuric acid It is necessary to add a little alkali during the crystallisation of this salt, however made It is useless to dyers, if it contain any iron A drop of tincture of galls or a solution of the alum will ascertain this —T C]

In medicine it has been considered as an astringent, and is of great service in restraining hemorrhages, and other immoderate secretions It is likewise externally used in lotions and eye waters and one scruple of burnt alum has been found beneficial in removing vio

lent colic pains arising from flatulency, bile, or great relaxation of the bowels; but in other cases it may prove hurtful.

It is used for various purposes by dyers to fix different colours upon cloth; in the making of candles, to give them a gloss and firm consistence; wood soaked in a solution of alum, does not readily take fire; and paper impregnated with it, is the most proper for the preservation of gunpowder, as it also excludes the moisture of the air. Tanners employ it to restore the cohesion of those skins which have been almost entirely destroyed by lime; and vintners in fining their wines, &c. Fishermen dry their cod-fish by means of it; and it is asserted, that bakers generally use it as an ingredient in bread: the truth of this assertion, however, has been much questioned, and the sole reason ascribed for its use, is, that corrupt flour, being mixed with good, thus acquires a proper degree of cohesion, as the aluminous particles equally pervade the whole mass and render it of a due consistence. Although some writers have maintained, that this styptic salt "is entirely innocent, and now seldom used" in the process of making bread, yet we have but too much reason to believe the contrary. The English translator of TISSOT's "*Advice to the People in general,*" &c. very pertinently remarks, that the abuse of alum, and other pernicious materials, introduced by *our* bakers, may too justly be considered as one lamentable source of the numerous diseases of children. The *Monthly Reviewer* of that book, for July, 1765, adds, with equal justice, the following commentary: "Hence obstructions in the bowels and viscera, feebleness, slow fevers, hectics, rickets, and other lingering and fatal diseases"

To discover such unlawful practices, requires no chemical skill: on macerating a small piece of the crumb of new-baked bread in cold water, sufficient to dissolve it, the taste of the latter, if alum has been used by the baker, will acquire a sweetish astringency. Another method of detecting this adulteration, consists in thrusting a heated knife into a loaf, before it has grown cold, and if it be free from that ingredient, scarce any alteration will be visible on the blade; but, in the contrary case, its surface, after being allowed to cool, will appear slightly covered with an aluminous incrustation. This method, we understand, is generally preferred in the experiments made by country justices. It deserves, however, to be remarked, that a very small proportion of alum, such as a few grains to a quartern-loaf, cannot be productive of any serious effects. In relaxed and scorbutic habits, or to those persons who are troubled with flatulency, bilious colic, and jaundice; such *medicated* bread may be conducive to the recovery of health; while to others, of a plethoric constitution, and a rigid fibre, it cannot fail to aggravate their complaints. In short, such addition to a common article of subsistence is, to say the least of it, highly improper, and ought not be intrusted to the hands of a mechanic.

One of the most important purposes, to which this concrete salt may be readily applied, is that of purifying and sweetening water that has become fetid and unfit for use. On long voyages, or at a distance from clear rivers and wells, each gallon requires, according to its impurity, only from five to ten grains of calcined alum, and double or triple that proportion of powdered charcoal, in order to render the most offensive water perfectly sweet and pellucid: both ingredients, however, ought to be preserved in close vessels, or otherwise their efficacy will be considerably diminished

Alum has also been tried in the boiling of salt, to render it of a firm consistence, but the good which was supposed to be derived from it, is now solely attributed to the effects of the slow and gentle heat, so that in this process it has of late been discontinued.

The manufacture of alum was first invented in the year 1608, and greatly encouraged in England, by Lord SHEFFIELD and other gentlemen of the county of York King JAMES the First assumed a monopoly of that article, and prohibited its importation

Beside the methods of detecting alum in bread, already stated, there is a chemical process, that consists in combining a little chalk with a small portion of aqua fortis and pouring the mixture on water, in which the suspected bread has been immersed for some time If there be any aluminous acid, its presence will become evident, by a gypseous or chalky mass deposited at the bottom of the vessel: in the contrary case no sediment will be formed.

In October, 1794, a patent was granted the Earl of DUNDONALD for his me-

thod of preparing alum, vitriol of argil, and other saline substances He directs aluminous, vitriolic or *pyritous schist* to be mixed with sea water, or with solutions of sea salt, kelp, sandiver, soap-boilers' ashes, or any saline matter, containing muriate of soda The liquor resulting from such mixture, is then boiled till it be sufficiently concentrated for crystallisation, after which it is mixed with a due proportion of alum schist, clay or other argillaceous ingredient The materials are next dried, pulverised, and submitted to the action of heat, till the muriatic acid be expelled the result of these various processes, is *alum.* The substance remaining may, by repeated washing and drying be used as a pigment, and, by collecting the muriatic acid in proper vessels, and combining it with volatile alkali, Lord D procures *sal ammoniac* A more diffuse account of his inventions, is inserted in the 11th vol of the "*Repertory of Arts,*" &c

Aurum sati um, L See Gold of Pleasure

AMALGAM, in chemistry and the arts, a mixture or alloy of any of the other metals with mercury

As mercury is habitually fluid in the common temperature, and as it is sufficient for most combinations that one of the bodies be fluid, it follows that without the help of heat, mercury may be amalgamated with many of the metals Hence there are two methods generally used in the making of amalgams The first is merely by trituration in a mortar, and without heat the second is by fusing the metal which is to be amalgamated, and by adding to it, when fused, the intended quantity of mercury

Amalgams are more or less soft according to the proportion of mercury employed if this be small they become solid, but brittle, and capable of being pulverised, if it be more considerable, a kind of paste is formed which has no ductility or tenacity, and if the proportion of mercury is very great, the amalgam is only distinguished from that substance by an appearance of foulness

Amalgam of Tin, is prepared in the same manner as that of lead, by pouring heated mercury into melted tinfoil This is much used for tinning mirrors, and enabling them to reflect images more sensibly and perfectly It was formerly employed in the preparation of mercury balls for purifying water, these were composed of four parts of tin and one of mercury, and were suspended in water, which was at the same time boiled, to purify it from extraneous matter Mr Canton observed that a small quantity of this amalgam, with a very little chalk or whiting, being rubbed on the cushion of an electrical machine, contributed very much to increase the power of electricity The amalgam of zinc is now preferred for this use

Amaranthus Blitum, L See Small Red Blite

Amaurosis See Gutta Serena.

AMBASSADOR, or *Embassador,* a representative sent by one nation to another Embassadors are ordinary or extraordinary An ordinary embassador is one who resides at the court or seat of government of a foreign power, as an officer of state, to maintain a mutual good understanding, to be watchful of the interest of his own nation, and to negotiate the affairs that occur This is a modern institution two hundred and fifty years ago, all embassadors were *extraordinary,* or such as were sent upon particular and pressing occasions These latter are now generally called *envoy extraordinary* Embassadors of kings are not to attend marriages or burials, nor public or solemn assemblies, unless their masters have an interest in them They are not to wear mourning, even for their own relations, because they represent the persons of their princes, and must resemble them in every thing Their persons are sacred, both in peace and war so that according to the law of nations, if hostilities break out between two nations, the respective embassadors are permitted to depart without molestation, and if, during the continuance of such hostilities, they are received into an enemy's country for the purpose of negotiation, they are to pass freely, and be treated with punctilious civility

AMBER (*Succinum*) is a hard, bituminous substance, possessing a subacid resinous taste, and a fragrant aromatic smell It is the production of many countries, but the best sort is, that which is found in various parts of England, especially in the clay and gravel-pits between Tyburn and Kensington, as well as behind St George's Hospital, near Hyde Park Corner, where fine specimens of this concrete are occasionally discovered Prussia possesses it in great abundance, and the king derives from this article alone an an-

revenue of 26 000 dollars: on which account the late FREDERICK professed himself to belong to the trade of *amber turners*.

Its most remarkable properties are, that it attracts other bodies to its surface, such as paper, hair, wool, &c. and that it presents a luminous appearance in the dark. In its native form, under ground, it resembles various substances, such as pears, almonds, peas, &c. but, when broken, leaves, insects, and other small objects, frequently appear inclosed: hence it has been supposed, that amber was originally in a fluid state, or that from its exposure to the sun it became softened, so as to be susceptible to those impressions. As these insects are never found in its centre, but always near its surface, the latter seems the more probable conjecture. Animals of all kinds, are extremely fond of it, and pieces are frequently discovered in their excrements. Several centuries before the Christian æra, it was in high esteem as a medicine; and PLATO, ARISTOTLE, and other writers, have commended its virtues: among the Romans, it was valued as a gem, and in the reign of NERO, brought in immense quantities to the capital, where it was highly prized by the fashionable ladies, who decorated themselves with trinkets made of that substance; a custom which is still prevalent at Munster in Westphalia, and other catholic countries, where it is converted into amulets, crosses, &c.

As a medicine, amber is at present but in little repute, though it is still given in *fluor albus*, hysteric affections, and in diseases which proceed from debility. Formerly, it was used in a variety of preparations, but of late, an aromatic balsam, a powder, and an essential oil, are the only forms in which it is employed.

Lastly, this bituminous matter constitutes the basis of several kinds of varnish. It is used for the coating of various toys, for staining the *papier maché*, and for the varnishing of carriages, for which last purpose, however, it is more profitable to dissolve the gum copal.

A method of making *artificial amber* has lately been discovered by Professor HERMSTAEDT, of Berlin. He placed rectified petroleum, about one line in thickness, on water, in a china saucer, which was exposed to the rays of the sun, for several months, beneath a glass bell containing oxygen. At length, the petroleum had absorbed the oxygen and sunk a little beneath the surface: the glass was removed, when after pouring off the water, and evaporating by a gentle heat that part of the petroleum which retained its fluidity, the condensed residuum was found to possess all the properties of *amber*. Such mode of preparing that valuable bitumen, however, would be too tedious to be generally adopted; but Prof. H. from this ingenious experiment, justly infers, that amber originates from petroleum, oxygenated and inspissated by its contact with the atmosphere, under the action of the sun.

AMBER, appears to be a bitumen, of fossil origin. It is found in the earth, and on the sea shore. It abounds more particularly in Prussia, which, on this account, once obtained the name of Country of Amber. Several hypotheses have been set up, respecting the nature of amber. By some, it is supposed to be resinous gum, oozing from pines, and falling on the earth, or into the sea; by others, a fossile formed in the earth, and washed ashore by the sea; and, by Dr. GIRTANNER, an animal product, nearly resembling wax. He relates, that the old pine forests are inhabited by a large species of ant which forms hills of about six feet in diameter, and that it is generally in these ancient forests, or in places where they have been, that fossile amber is found. This substance is not hard, like that taken up on the shores of Prussia: it has the consistence of honey, or of half melted wax: but it is of a yellow colour, like common amber; it gives the same produce by chemical analysis, and it hardens, like the other, when it is suffered to remain for some time in a solution of common salt. Insects are found in amber; among these, ants are always the most general; circumstances that undoubtedly support Dr Girtanner's opinion. According to this gentleman, amber is nothing but a vegetable, rendered concrete by the acid of ants, as wax is an oil, hardened by the acid of bees. Pliny describes amber as oozing from certain trees of the fir kind, grown in the islands of the northern ocean: the liquor, he says, previously congealed by the cold, falls into the sea, and is carried by the waves to Prussia, the nearest continent. From the various accounts that are given, it is certain, that amber is found in great quantities beneath the earth, and picked up on the sea-shores, in many parts of the world. In England, it has been found in clay pits, and on the coast

Amber is of several colours: it is commonly yellow, varying from the lemon to the orange; in other instances it is whitish, or somewhat inclining to brown. The yellow gold-coloured amber is so transparent, and so susceptible of the highest polish, that it has been ranked among precious stones, and is applied to various purposes of elegance. It is made into all sorts of trinkets. A French writer of the present age observes, that amber was once fashionable in France; and fell into obscurity when costly metals and jewels grew sufficiently common to be subservient to luxury: but the medicinal virtues of amber, he subjoins, have not suffered the same fate; these, says he, will render it, in all ages, more precious than the brightest gems. It is prepared in the several forms of a tincture, an oil, and a salt, and recommended as a cordial and nervous medicine. It is a principal ingredient in the composition of all varnishes. As a cabinet curiosity, it is valuable on account of the insects, pieces of moss, &c. that are frequently found in it. The inclosure of these objects evidently proves that amber is originally in a soft state; at which time, insects, leaves, and other casual matters are liable to adhere.

This curious production of nature is inflammable, and, when heated, yields a strong and bituminous odour. Its most extraordinary properties are those of attracting, after it has been exposed to a slight friction, straws, and other surrounding objects; and of producing sparks of fire, visible in the dark. Many thousand years before the science of electricity had entered the mind of man, these surprising qualities were known to exist in amber, and hence the Greeks called it *electrum.* The Romans, supposing it to be a vegetable juice, named it *succinum;* by the Arabs it is denominated *ambra,* whence the French write it *ambre,* and the English. *amber.*

AMBERGRIS, or Grey Amber, is a solid opaque, bituminous substance, of a greyish or ash colour, usually intermixed with yellow and blackish veins. This concrete is found floating on the sea, or thrown on the shores, and is produced in the greatest quantity by the Indian Ocean. It has been some- . . lso discovered by fishermen in the bellies of whales, in lumps of various sizes, from half an ounce to one hundred pounds in weight. Hence it is supposed to be an animal production. Clusius, however, asserts, that it is an indurated and indigested part of the food collected by these fish, and forms a similar concretion with that of the *bezoar* found in the stomach of other animals. When pure, it softens between the fingers: melts into an oil, in a moderate degree of heat, and, in a stronger one, proves highly volatile. Slightly warmed, it emits a fragrant odour, and when set on fire, smells like amber. It dissolves, though with difficulty, in spirits of wine, and essential oils, but not in those which are expressed from vegetables, nor in water.

In Asia, and part of Africa, ambergris is not only used in medicine, and as an article of perfumery, but also applied to the purposes of cookery, by adding it as a spice to several dishes. It is valued by the Turks, as an *aphrodisiac,* and erroneously supposed to promote longevity.

It was formerly esteemed a cordial, and to be of great service in disorders of the head, and nervous complaints; but it now chiefly serves as an agreeable perfume, and is certainly free from many of those inconveniences which usually accompany substances of this description.

Ambergris may be considered as genuine, when it emits a fragrant smell, on thrusting a hot needle into its substance, and melts like fat of an uniform consistence.

AMBURY, in farriery, signifies a tumour, or wart which is soft to the touch, and full of extravasated blood. It is a disorder incident to horses, and may be cured by the following method. Tie a strong hair very tight round the part affected; and, after it has spontaneously fallen off, which usually happens in about eight days, sprinkle powdered verdigris on the place, to prevent a return of the complaint. When, from its local situation, it can not be tied, it may be either cut out with a knife, or burnt away with a sharp hot iron; or, where this cannot be practised with safety, for instance, in sinewy parts, it may be removed by applying oil of vitriol, or corrosive sublimate to the tumour. During the cure, the animal must be kept quiet, and free from every exertion.

AMENDE-HONORABLE, is an open apology for an injury done. The name is taken from an old custom in the criminal law of France.

AMERCEMENT, a pecuniary punishment imposed upon offenders at the mercy of the court. Amercements differ from fines, the latter depending, on

proceeding from some statutes, the former one imposed arbitrarily in proportion to the fault.

AMETHYST, a precious stone, being Quartz, of a violet or purple-violet colour. Its name is derived from its colour, as likened by the ancients to that of wine and water. The hues of different amethysts are as various as the tints of purple; that is, as all the mixtures of blue and red. These stones are sometimes found in the form of pebbles and sometimes in the angular shapes usual among all crystalline objects, in the mountains of Auvergne, in Germany and Bohemia, and in a mountain of Catalonia in Spain. [They are found at Chester creek, in Chester county, Pennsylvania, and in South Carolina. They are imitated by manganese.—T. C.]

AMMONIA signifies a salt, of which there are two sorts, the native and the factitious The former, described by PLINY, and DIOSCORIDES, was generated from the urine of camels, in the inns, or caravanseras, where the pilgrims, returning from the Temple of *Jupiter Ammon*, used to lodge: whence it derived its name. The latter is a chemical preparation, formed either of the acetous or muriatic acids, combined with volatile alkali. A salt nearly of the same kind is thrown out by Mount Etna. The ancient sal ammoniac was said to possess the properties of cooling water, and dissolving gold.

Great quantities of this concrete were formerly brought from Egypt, where it was originally prepared by sublimation from the soot of animal dung; though at present we are principally supplied from our own manufactories, several of which are established in different parts of Britain, but that in the vicinity of Edinburgh is one of the most extensive.

Although the cheapest and most convenient method of preparing it is not generally known, yet it is conjectured to be chiefly formed in Egypt of a combination of sea salt and soot. It is commonly crystallised in the form of large, round cakes, and sometimes in conical loaves. The best sort is colourless, almost transparent, and free from visible impurities. The taste of this salt is very sharp and penetrating. It dissolves in rather less than thrice its weight of water; and upon evaporating, a part of the liquor concretes again into thin shining spicules, or plates, like feathers

[Sal ammoniac has been made in Philadelphia thus.—In a long sheet iron cylinder, hoofs, parings of skins, and other animal offal, are distilled. An iron pipe is fixed in the farther end of the cylinder, which communicates with a hogshead placed as a receiver. A carbonated ammoniacal liquor, mixed with a fœtid empyreumatic oil, comes over, and condenses in a small quantity of water placed in the hogshead. When a good deal of liquor is accumulated, part of the oil swims at the top, and part sinks to the bottom. The liquor is boiled with common salt, and plaister of Paris, or gypsum, which is sulphate of lime. All these salts act on each other. The sulphuric acid of the gypsum seizes the soda of the common salt, and forms Glauber's salt; while the muriatic acid of the common salt combines with the volatile alkali, and forms sal ammoniac; the carbonic acid of the carbonate of ammonia, unites to the lime, and falls down in powder of limestone.—T. C.]

Sal ammoniac, when pure, promotes perspiration, and in some cases, increases the secretion of urine A drachm of it, dissolved in water, if the patient be kept warm after taking it, generally proves sudorific. By moderate exercise in the open air, it beneficially operates on the kidneys; given in a large dose, it proves aperient; and in a still larger, acts as an emetic

This salt has also been employed externally, as an embrocation for bruises; and in gargarisms, for inflammations of the tonsils, [1 oz. in a pint of vinegar.—T. C.]

Ammonia pura, or the caustic vegetable alkali, has been recommended for persons bitten by snakes, and other venomous animals. Sixty drops of it, sufficiently diluted with water, make a moderate dose, which ought to be repeated according to the urgency of the symptoms. At the same time, the wound should be washed with a similar mixture.

It is positively asserted, that such treatment has been attended with uniform success, when the patient was able to swallow the medicine.

MR J WILLIAMS in a late publication speaks in the most positive manner of the good effects of the volatile alkali, (spirits of hartshorn, or spirit of sal ammoniac) in curing the bites of venomous snakes in the East Indies. The cure consists in the immediate application of a bandage around the bitten limb; in washing the wound with volatile alkali: and in the repeated ad-

The former usually consist of balls, plays, entertainments, &c. the latter, of the various diversions of cards, chess, back gammon, and other games of chance or skill.

Those of an active kind ought always to be preferred, as they not only relieve the mind, when wearied with intense application, or depressed with grief, but by their agreeable variety, together with the advantages of air, exercise, &c. they are highly conducive to health. On this account they are particularly serviceable to such persons as are subject to nervous and hypochondriacal complaints, and to all those who lead a confined or sedentary life. Private amusements, on the contrary, are principally employed with a view to consume time, and frequently require more application than either study or business Those amusements which afford the most violent exercise, and ought, therefore, to be pursued only by the healthy and robust, are hunting, shooting, cricket-playing, hand-ball, and similar games When these are undertaken with the necessary adaptation to the strength of the individual, they promote perspiration and other secretions, expand the lungs, and give firmness and agility to the whole frame

With respect to the amusements of children, we shall here only remark, that they may be compared to the labours and pursuits of adults, and that their influence, as well on health, as on the future inclinations and desires of the individual, is much greater, and more permanent, than is generally supposed Hence we should advise parents and guardians to encourage no games, or play things, which have a tendency to impair the constitution, or deprave the morals, of their offspring; of this nature are, improper and unnatural postures, or gesticulations of the body, wanton jumping up and down high places, forcible exertions of muscular power, by lifting great weights and carrying ponderous bodies; the partial exercise of one arm or leg; sedentary plays of long duration, the standing for hours on their legs, musical wind-instruments; toys manufactured by common potters, or made of plaster of Paris, drinking vessels of lead, pewter, white iron, bell metal, or earthen ware, imperfectly burnt and glazed, play things coloured or painted with noxious metallic preparations, such as verdigris, orpiment, minium, as well as those devices and similar trifles produced by the confectioner, &c On this interesting subject, we refer the reader to a work lately published, from the German, of Dr STRUVE, entitled, "*A Familiar Treatise on the Physical Education of Children;*" with three Introductory Lectures, and Notes, by Dr MEASE. See also, "*Edgeworth on Education,*" 2 vols

Amygdalus See ALMOND.

ANAGRAM, a happy transposition of the letters of a word or sentence, in such a manner as to form another. Various examples might be adduced, but a modern one may be most acceptable. Of the letters which compose the words "*Revolution Française,*" after taking away those which make the word *veto*, the following sentence has been formed: *Un Corse la finira;*" *i. e.* "A Corsican shall finish it."

ANALYSIS, in chemistry, is the separation of any substance into its constituent parts, to ascertain their nature, relative proportions, and their mode of union Thus, water by chemical analysis is found to consist of certain proportions of hydrogen and oxygen. Again, nitrate of ammonia is a salt composed of nitric acid, ammonia, and water, but each of these are compounds, nitric acid consists of azote and oxygen, ammonia, of azote and hydrogen, and water, of hydrogen and oxygen, so that the three simple substances which enter into nitrate of ammonia are azote, hydrogen, and oxygen.

ANAMORPHOSIS, in perspective and painting, a representation of an image either on a plane or curved surface, deformed, or distorted, which in a certain point of view appears regular and in just proportion

Ananas See PINE-APPLE

ANATOMY, the art of dissecting, or skilfully separating the solid parts of an animal, in order to discover their situation, figure, and connexion. By anatomy, is generally understood the dissection of the human body in particular: that of the bodies of brutes is called, with reference to the former, comparative anatomy The use of the art is, that by its assistance a guide is afforded to the operations of medicine and surgery Considered by itself, it is, doubtlessly, an admirable pursuit for a contemplative mind but if, after a sterile examination of the separated parts of the body, we do not proceed to consider the whole machine re united and complete, this labour resembles many others, which do infinite honour to the human mind, and are stupendous monuments of its patience

though unproductive of any real utility

As a philosophic inquiry, it may be observed that it is impossible not to be interested in the conformation of our own bodies: as a religious one, it will not fail to impress us with the most becoming ideas of our creator. Considered as a matter of ordinary education, it cannot be too strongly recommended. No arguments, perhaps, can so effectually check the irregularities and acts of intemperance, which endanger our health and happiness, as those which a little knowledge of anatomy and medicine will suggest.—A general view of a subject is certainly the best introduction to particular investigation: and of such a nature, the following elegant and comprehensive description of the structure of the human body, by the late Dr. HUNTER, will be found :

"In order to acquire a satisfactory general idea of this subject, let us, in imagination, *make* a man: in other words, let us construct a fabric fit for the residence of an intelligent soul. This soul is to hold a correspondence with all material beings around her; and, to that end, she must be supplied with organs fitted to receive the different kinds of impressions which they will make. In fact, therefore, we see that she is provided with the organs of sense, as we call them: the EYE is adapted to light; the EAR to sound; the NOSE to smell; the mouth to taste; and the SKIN to touch. Farther, she must be furnished with organs of communication between herself in the brain and those organs, to give her information of all the impressions that are made on them: and she must have organs between herself in the brain and every other part of the body, fitted to convey her commands and influence over the whole. For these purposes, the NERVES are actually given They are chords which rise from the brain, the immediate residence of the mind, and disperse themselves in branches through all parts of the body They are intended to be occasional monitors against all such impressions as might endanger the well-being of the whole, or of any particular part; and this vindicates the Creator of all things in having actually subjected us to those many disagreeable and painful sensations, which we are exposed to from a thousand accidents in life. Moreover, the mind, in this corporeal system, must be endued with the power of moving from place to place, that she may have intercourse with a variety of objects; that she may fly from such as are disagreeable, dangerous, or hurtful, and pursue such as are pleasant, and useful to her; and, accordingly, she is supplied with MUSCLES and TENDONS, the instruments of motion, which are found in every part of the fabric where motion is necessary: but, to give firmness and shape to the fabric; to keep the softer parts in their proper place; to give fixed points for, and proper directions to, its motions, as well as to protect some of the more important and tender organs from external injuries, there must be some firm prop-work interwoven through the whole:—and, in fact, for such purposes the BONES were given. The prop work must not be made into one rigid fabric, for that would prevent motion Therefore, there are a number of bones. These pieces must all be firmly bound together to prevent their dislocation and this end is perfectly answered by the LIGAMENTS. The extremities of these bony pieces, where they move and rub upon one another, must have smooth and slippery surfaces of easy motion. This is most happily provided for by the CARTILAGES and mucus of the joints. The interstices of all these parts must be filled up with some soft and ductile matter, which shall keep them in their places, unite them, and at the same time allow them to move a little upon one another: and these purposes are answered by the CELLULAR MEMBRANE, or adipose substance. There must be an adequate covering over the whole apparatus, both to give it compactness and to defend it from a thousand injuries; which, in fact, are the very purposes of the SKIN, and other integuments. Lastly, the mind being formed for society and intercourse with beings of her own kind, she must be endued with powers of expressing and communicating her thoughts by some sensible marks or signs, easy to herself, and capable of great variety: and accordingly she is provided with the organs and faculty of SPEECH, by which she can throw out signs with amazing facility, and vary them without end.

"Thus we have built a body which seems to be pretty complete: but, as it is the nature of matter to be worked upon and altered, so, in a very little time, such a living creature must be destroyed, if there is no provision for repairing the injuries which she will commit upon herself, and those which she will be exposed to from [illegible] actu. Therefore, a treasure of BLO[illegible]

ally provided in the heart and vascular system, full of nutritious and healing particles, fluid, and able to penetrate into the minutest parts of the animal: impelled by the HEART, and conveyed by the ARTERIES, it washes every part, builds up what was broken down, and sweeps away the old and useless materials. Hence we see the necessity or advantage of the heart and arterial system. What more than enough there was of the blood to repair the present damages of the machine, must not be lost, but should be returned [illegible] to the heart; and for this purpose the VEINS are actually provided. These requisites in the animal explain *à priori*, the CIRCULATION of the blood. The old materials, which are become useless, and are swept off by the current of the blood, must be separated and thrown out of the system. Therefore the GLANDS, the organs of secretion, are given for straining whatever is redundant, vapid, or noxious, from the mass of blood; and, when strained, they are thrown out by EMUNCTORIES, called organs of excretion. But now, as the machine must be constantly wearing, the operations must be carried on without intermission, and the strainers must be always employed: therefore, there is actually a perpetual circulation of the blood, and the secretions are always going on. Even all this provision, however, would not be sufficient: for that store of blood would soon be consumed, and the fabric would break down, if there were not a provision made for fresh supplies. These we observe in fact are profusely scattered ro nd her in the animal and vegetable kingdoms; and she is furnished with hands, the fittest instruments that could have been contrived, for gathering them, and for preparing them in a variety of ways for the mouth. But these supplies, which we call food, must be considerably changed: they must be converted into blood. Therefore, she is provided with teeth for cutting and bruising the food, and with a stomach for melting it down: in short, with all the organs subservient to digestion.—The finer parts of the aliments only can be useful in the constitution; these must be taken up and conveyed into the blood, and the dregs must be thrown off. With this view, the INTESTINAL [illegible]AL is actually given. It separates [illegible] nutritious part, which we call CHYLE, [illegible] be conveyed into the blood by the [illegible]m of the ABSORBENT VESSELS; and the [illegible] T[illegible]mass downward out of the body. [illegible] see that, by the very imperfect survey which human reason is able to take of this subject, the animal man must necessarily be complex in his corporeal system, and in its operations; and in taking this general view of what would appear, *à priori*, to be necessary for adapting an animal to the situations of life, we observe, with great satisfaction, that man is accordingly made of such systems, and for such purposes. He has them all: and he [illegible] nothing more, except the organs of respiration. Breathing it seemed difficult to account for *à priori*: we only know it to be a fact, essentially necessary to life. Notwithstanding this, when we saw all the other parts of the body, and their functions so well accounted for, and so wisely adapted to their several purposes, there would be no doubt that respiration was so likewise: and accordingly, the discoveries of Dr. Priestley have lately thrown light upon this function also.

"Of all the different systems in the human body the use and necessity are not more apparent, than the wisdom and contrivance which have been exerted in putting them all into the most compact and convenient form: in disposing them so that they shall mutually receive and give helps from one another; and that all, or many, of the parts shall not only answer their principal end or purpose, but operate successfully and usefully in a variety of secondary ways. If we consider the whole animal machine in this light, and compare it with any, in which human art has exerted its utmost skill (suppose the best-constructed ship that ever was built), we shall be convinced, beyond the possibility of doubt, that there exists intelligence and power far surpassing what human art can boast of. One superiority in the animal machine is peculiarly striking. In machines of human contrivance, or of art, there is no internal power, no principle in the thing itself, by which it can alter and accommodate itself to any injury that it may suffer, or make up any injury that admits of repair; but in the natural machine, or animal body, this is most wonderfully provided for by the internal powers of the machine itself; many of which are not more certain and obvious in their effects, than they are above all human comprehension as to the manner and means of their operation. Thus, a wound heals up of itself; a broken bone is made firm again by a callus, a dead part is separated and thrown off, noxious juices are driven

out by some of the emunctories; a redundancy is removed by some spontaneous bleeding; a bleeding naturally stops of itself; and a great loss of blood, from any cause, is in some measure compensated by a contracting power in the muscular system, which accommodates the capacity of the vessel to the quantity contained. The stomach gives information when the supplies have been expended, represents with great exactness the quantity and quality of what is wanted in the present state of the machine, and in proportion as she meets with neglect rises in her demand, urges her petition in a louder tone, and with more forcible arguments. For its protection, an animal body resists heat and cold in a very wonderful manner, and preserves an equal temperature in a burning and in a freezing atmosphere. These are powers which mock all human invention or imitation: they are characteristics of the divine architect!"

ANATHEMA, among ecclesiastical writers, imports whatever is set apart, separated or divided; but the word is most usually intended to express the cutting off a person from the privileges of society, and from communion with the faithful. The anathema differs from simple excommunication, in as much as the former is attended with curses and execrations.

ANCHOVY, or *Clupea encrasicolus*, L. a small fish of the herring-kind, taken in immense quantities on the coast of the Mediterranean Sea, whence they are imported into Britain, in a pickled state. They are in general from 3 to 4 inches in length, have a pointed head, a wide mouth, destitute of teeth, and the gums are uncommonly rough. According to COLLINS, these diminutive fish are, likewise, found in abundance, on the western coasts of England and Wales.

The fishing for anchovies is principally carried on during the night; when a light being affixed to the stern of a small vessel, the anchovies are thus attracted, and caught in nets. It is, however, asserted, that they are neither so good, firm, nor so proper for pickling, as those taken without this stratagem. After having secured these delicate fish, their heads are cut off; the intestines extracted; and the bodies salted, and deposited in barrels.

In the choice of anchovies, such as are small, round-backed, fresh pickled, white on the outside, and red within, deserve to be preferred; because those of a flat, or large form, are frequently a spurious sort, called *Sardinias*. Independently of these qualities, the pickle should possess a fine taste and flavour.

Anchovies are variously prepared: after *boning* them, and taking off the tails and fins, they may either be eaten with oil and vinegar; or, by mincing them with pepper, &c. be formed into sauce for other fish. They are likewise packed in earthen vessels, closely covered, so as to exclude the air: by this simple precaution, their flavour may, for a long time, be preserved. But the most effectual method of keeping these fish in a concentrated state, is that of reducing the fleshy part to a soft pulp, of the consistence of butter; and, after adding pepper or other spices, the *extract of anchovies*, thus prepared, should be put in gallipots, first covered with a round piece of fine writing paper, or hog's bladder; and then melted beef suet in a luke-warm state, must be poured over the whole so as to leave about half an inch space between this air-tight covering and the top of the vessel, which is again secured with strong paper.

ANCIENT, OLD, ANTIQUE, are words that express age, in different degrees. A fashion is old when it ceases to be used; ancient when it has been long out of use; and antique when it has been long ancient. Young is opposed to old; new to ancient; and modern to antique. A man is said to be old, a family ancient, a statue or other monument antique. Old implies decrepid; ancient, immemorial; antique, remote. Old age diminishes the powers of the body, and enlarges the extent of the mind; ancientness takes away the beauty of garments, and gives authority to titles; antiquity weakens the evidence of history, and gives value to monuments. The epochs beyond which it is now generally agreed to call men and their works ancient, is that of the taking of Constantinople by Mahomet II. which event happened A. D. 1453. It was then that Europe began to re-emerge from barbarism. Tuscany opened her arms to men of genius in arts and literature, who took refuge in her bosom from the general storm.

ANCIENT LANGUAGES are those which are no longer spoken by a living people. [The most ancient known language is probably the Sanscrit. The Chaldee seems to have taken its origin also from Hindostan. The Phœnician was a dialect of the Chaldee; so is the Hebrew; for we find Abraham was a

Chaldean. Some people derive the Phœnician from the Hebrew, for which there is no reasonable pretence, for the Phœnicians, Canaanites, or Philistines, were settled on the borders of the Red Sea, long before the Hebrews or Jews were known as a nation. At least so it appears from the Scriptures.

Greek and Latin are of Phœnician origin.* It has been doubted, whether these languages ought to occupy so large a part of youthful education. In our opinion, if a boy be designed for trade, he can apply his time better. If he wishes for the education of polished society, or if he be intended for the learned professions, he ought to be acquainted with these languages. The Latin indeed seems indispensible, to science, to taste, and to a relish for all the beauties of language, whether in poetry or in prose, and to a full comprehension of the allusions of our best writers. See a piece on this subject, 1 Port Folio, third series, p. 567.—T. C.]

ANCIENT LEARNING, signifies a thorough acquaintance with the writings of the ancients. A very great and illiberal prejudice has for some time since existed, which has induced us to give a constant preference to the ancients, for their genius, as well as their virtue. Their innocence, courage and skill in writing, have been extolled as superior to our modern acquirements, and proposed to us as a standard of real perfection. Few authors indeed, have been suffered to wear their laurels during life; these have been generally reserved either to crown their statues, or entwine around their tombs. HOMER, in his days, was considered as a mere ballad singer; he is now a bard. SHAKSPEARE lived a precarious hireling. MILTON's divine poem lay long neglected, and was sold for a song. OTWAY lived and died in a corner. CERVANTES passed his days in poverty and obscurity, a living reproach to Spain; and the first of our English philosophers, the immortal NEWTON, was indebted to the officious kindness of a BARROW, to announce his merit to the world. Praise is slower than censure, because the former is retarded by envy and contention, which time alone, the final subduer of all things, can effectually remove. 'Tis the same in the moral as in the natural world: the sun exhibits the largest disk, when about to quit our hemisphere. The ancients have acquired a prejudged hereditary admiration, and their only solid grounds of preference are, that they had the good fortune to come first into the world. Thus, by the laws of primogeniture, the eldest son inherits the patrimony, to the detriment of the rest of the family.

It cannot, however, be disputed, that the ancient writers have left us performances which would reflect the highest honour on any age or nation; but to allow them the merit of exclusive excellence, is injustice to their competitors. A principle of tenderness has been urged as a plausible reason for entertaining a partiality for the ancients, and that the infant state of learning ought to experience the same flattering indulgence which is shewn to young children. The weakness of this plea is evident: and candour obliges us to declare, that it is equally unjust and improper to consider the Greeks and Romans, with all their inaccuracies and defects, as perfect models of imitation. Many an ancient writer, whose real beauties have been justly admired, has also frequently been praised for his faults: thus his reputation has been sullied: instead of being indebted to his panegyrists, he has excited doubts and censures, where he had least deserved them.

[The study of ancient languages, however, is useful, 1st, in affording us more accurate knowledge of ancient times, persons, languages, manners and literature, than we can possibly obtain without them. 2dly. In tracing the progress of literature. 3dly. In furnishing models of admirable composition, and just sentiment. 4thly. In affording the means of understanding the allusions so frequently made by the best authors in our native tongue, to the persons, manners, compositions, &c. of the ancients. Indeed we cannot satisfactorily peruse our best authors without this. 5thly. In making us better acquainted with the words derived from ancient languages and adopted in our own. 6thly. They are indispensible to a well educated divine, physician and lawyer, and to every literary man, and person desirous of cultivating a taste for belles lettres.

* [The well known Phœnician or Punic passage in one of the comedies of Plautus, can be made intelligible either by the Hebrew language, as Bochart has shewn, or by the Irish language, as Major Vallencey has shewn. See 4 Port Folio, third series, p. 409. 180.—T. C.]

7thly. They are of great use in aiding us to learn modern languages.—T. C.]

ANCIENT TIMES are those which refer to remote periods of antiquity.

The degeneracy and corruption of modern times, as opposed to those of the ancients, have afforded a fruitful source of peevish invective, and an endless cause of querulous complaint, to both the learned and the illiterate. It has been the constant custom, at all times, to declare every succeeding age more wicked than the former; to represent the world as perpetually increasing in vice and folly; to lament the good old days that are past, and to anticipate nothing but misery from the future. Yet, however corrupt or vicious may be the age in which we live, let us but impartially compare the history of past times with those of our own, and we shall find no great reason to unite in the general outcry: on the contrary, it is highly probable, that our successors will attribute more virtues to us, than are possessed by themselves; though, perhaps, neither may be less virtuous, or more depraved, than the most celebrated nations of antiquity.

ANCONY, in the iron works, a piece of half-wrought iron, of about three-quarters of a hundred weight, of the shape of a bar, at the middle, but rude and unwrought at the ends. To bring the iron into this state, a piece of a proper size, from a *sow* of cast iron, is melted: this is hammered at the forge into a mass of two feet long, and of a square shape, which is called a *bloom;* when this is done, it is sent to the *finery*, where, after two or three heats and workings, it is brought to this figure, and called an *ancony*. The middle part, beat out at the finery, is about three feet long, and of the shape and thickness that is to be given to the whole: this is then sent to the *chafery*, and there the ends are wrought to the shape of the middle, and the whole is made into a bar.

ANEMOMETER signifies a mechanical instrument for ascertaining the power and velocity of the wind.

Successful methods have been discovered to determine, with precision, the various properties of the air, its temperance, humidity, and weight, by means of the thermometer, the hygrometer, and the barometer, but, till lately, no attempts have been made to ascertain the force of the wind. Several instruments for this purpose, have, indeed, been contrived; but they are in general more complicated, and less to be depended on, than the machine which we shall describe under the head of ANEMOSCOPE.

ANEMONE, or WIND-FLOWER, is the name of a plant chiefly distinguished on account of its beautiful flowers, which by the Greeks, were supposed not to open till the wind blows; whence it has received it original name. LINNÆUS enumerates 21 species, of which the following four deserve particular notice, though the first of these is not indigenous.

1. *Anemone pratensis*, L. the dark-flowered, or Meadow Anemone, as described and represented in Dr WOODVILLE's *Medical Botany*, vol. iii. p. 400, plate 148. It produces beautiful dark violet, or almost black flowers, which blow in March and April,* and never expand.

In its recent state, the meadow anemone is almost flavourless, though its taste, when chewed, is extremely pungent, and corrodes the tongue and fauces; a property also manifested in a slight degree by the dried leaves.

The dark violet leaves of this species, when boiled together with those of the *Serratula tinctoria*, L. or common saw-wort, and a proper addition of alum, affords, according to Prof. PALLAS, an excellent water colour for landscape and other paintings.

2. *Anemone pulsatilla*, L. or Pasque Flower, so called because it generally blossoms about Easter, when it adorns some of our dry, chalky-hills. In April it bears beautiful bell-shaped flowers, of a purple or reddish colour. A description and representation of it may be found in SOWERBY's *English Botany*, p. 4, 5–51.

As it is a poisonous plant, the inhabitants of Kamtschatka use its leaves for staining their arrows; which unless the wound be immediately cleansed, and the communicated virus extracted by the mouth, are said to prove inevitably fatal: in like manner, these untutored savages destroy the whales which frequent their coast.

Both the flowers and leaves of this species are employed by foreign dyers for green colours of various shades. From the expressed juice of the leaves,

* Some botanical writers confound this plant with the *Anemone pulsatilla*, L. which is a distinct species. The *Anemone pratensis*, L. is a native of Germany, where its flowers in the beginning of May: it was thence imported into England, and cultivated in our gardens by the late and justly celebrated MILLER, about the year 1731.

a green ink may be prepared; and if the florets only be used, it will be a lighter shade, but from the whole flower, the colour will be much deeper.— Relying on the authority of DAMBOURNEY, we shall add, that animal wool previously immersed in a solution of bismuth, acquires a pleasing light *vigogne* colour.

3. *Anemone nemorosa*, L. or the Wood Anemone; another wild sort, bearing only one white, or sometimes purplish, flower on a plant. See CURTIS's *Flor. Lond.* ii. 38.

In medicine this plant may be usefully employed as a substitute for *cantharides*, or Spanish flies; for it produces not only a more speedy, but less painful effect. Its juice is so extremely acrid, that it has been justly suspected to occasion the dysentery among cattle, and inflammation, accompanied with a discharge of bloody urine, in sheep. Hence the necessity of guarding these animals against the cause of distempers which are frequently so formidable in their consequences, as to deprive the unwary husbandman of a great portion of his most valuable live stock.

4. *Anemone ranunculoides*, L. or the Yellow Wood Anemone. See p. 5. GERARD's *Herbal*, 383 1.

On account of its corrosive acrimony, the juice of this vegetable is also used by the inhabitants of Kamtschatka, for a similar deleterious purpose as is mentioned of the second species.

In the United States, we have,

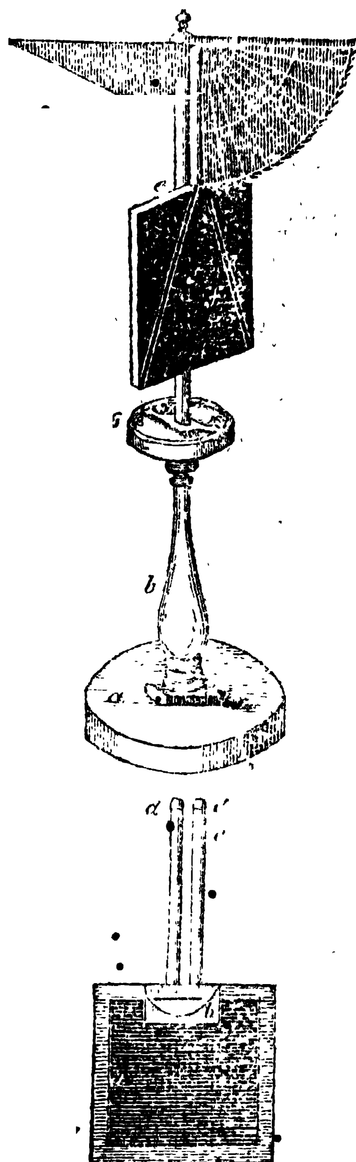
1. *Anemone Virginiana*,
2. *A. Pennsylvanica*,
3. *A. Quinquefolia*,
4. *A. Thalictroides*. This last grows near the city of Philadelphia in the woods, and deserves to be cultivated for its elegant simplicity.

ANEMOSCOPE, a mechanical instrument for determining the course and velocity of the wind. That part which exhibits the former, or shows from what point of the compass the wind blows, consists of an index, moving round an upright circular plate, like the dial of a clock; on which, instead of the hours, the thirty-two points of the compass are represented. The index which points to the divisions on the dial, is turned by a horizontal axis, having a trundle-head at its outward extremity. This trundle-head is moved by a cog-wheel, on a perpendicular axis; at the top of which is fixed a vane, moving with the course of the wind, and imparting motion to the whole machine. The contrivance is extremely simple, and requires in its construction only, that the number of cogs in the wheel, and rounds in the trundle-head, be equal; because when the vane moves entirely round, the index of the dial should also make a complete revolution. An anemoscope of this construction is placed in one of the turrets of Buckingham-house, the residence of Her late Majesty.

The anemoscope invented by Mr. PICKERING, and published in the *Philosophical Transactions*, No. 473, is a machine four feet and a quarter high, consisting of a broad and weighty pedestal, a pillar attached to it, and an iron axis, about half an inch in diameter, fastened into the pillar. Upon this axis turns a wooden tube; at the top of which is placed a vane, of the same materials, 21 inches long, consisting of a quadrant, graduated, and shod with an iron ring, notched to each degree; and a counterpoise of wood on the other, as represented in the figure. Through the centre of the quadrant runs an iron pin; upon which are fastened two small round pieces of wood, serving as moveable radii to describe the degrees upon the quadrant, and as handles to a velum or sail: the pane of which is one foot square, made of canvas stretched on four battens, and painted. On the upper batten, next to the shod rim of the quadrant, is a small spring, which catches at every notch, corresponding to each degree, as the sail may be raised on the pressure of the wind, and thus its falling back prevented, when the force of the wind decreases. At the bottom of the wooden tube is an iron index, which moves round a circular piece of wood fastened to the top of the pillar, on the pedestal, where the thirty-two points of the compass are described. We have annexed a representation of this machine: *a* is the pedestal; *b* the pillar on which the iron axis is fitted; *c*, the circle of wood representing the points of the compass; *e*, the wooden tube upon its axis; *f*, the velum; *g*, the graduated quadrant; *h*, the counterpose of the vane. The subjoined figure represents the velum, which may be taken off; *a*, is the plane of the velum; *b*, the spring; *c c*, the wooden radii; *d, d*, the holes through which passes the pin, in the centre of the quadrant.

This instrument serves the following useful purposes:

1. Having a circular motion round the iron axis, and being furnished with



a vane at the top, and an index at the bottom, as soon as the artificial points described on the round piece of wood on the pillar are fixed to the corresponding quarters of the heavens, it faithfully points out the quarter from which the wind blows

2. Being furnished with a velum, or sail, elevated by the wind, along the arch of the quadrant, to an height proportionate to the power of the column of wind pressing against it, its relative force and its comparative power, at any two times of examination, may be accurately taken.

3. By means of a spring fitted to the notches of the iron, with which the quadrant is shod, the velum is prevented from returning upon the fall of the wind; and the instrument, without the trouble of watching it, ascertains the force of the highest blast, since the last time of examination.

This machine may be confidently depended upon, as the velum is hung so nicely, that it is susceptible of the most gentle breeze, and will also describe the force of the wind in a violent storm. There is, however, reason to apprehend, that by exposing the anemoscope to all winds, especially to irregular blasts and squalls, for a length of time, it may become inaccurate. The observer ought, therefore, to take the tube with its vane and velum, in his hand, with a view to learn the force of the wind, and, after having made his observation, he should return with the machine into the house, till the violence of the storm subside.

ANEURISM, in surgery, signifies a throbbing tumor, occasioned by the dilatation or rupture of an artery: it consists of three kinds, viz. the true or encysted, the false or diffused, and the varicose.

The true aneurism, when situated near the surface of the body, produces a tumor, at first small and circumscribed, but, when pressed by the finger, it manifests a distinct pulsation. By degrees it increases, and becomes more prominent; still, however, the patient does not complain of any pain. As it grows larger, the skin turns more pale than usual, also more phlegmonous, or swollen, and at length assumes a livid and gangrenous appearance. A bloody serum now oozes through the integuments; the skin cracks in several places; and the artery, being deprived of the usual resistance, discharges its blood with such velocity as to occasion almost instantaneous death

The false aneurism consists of a wound or rupture of an artery, and, by the extravasation of blood, produces a swelling of the contiguous parts. If not improperly treated by constant and close pressure, it generally remains nearly of the same size, for several weeks Instances have occurred, where the blood has diffused itself over the

whole arm in a few hours; as, on the contrary, swellings of this kind have been months, nay, even years, in arriving at any considerable size.

The varicose aneurism is that which arises from the puncture of an artery, and sometimes happens in blood-letting. This circumstance, it is hoped, will point out the necessity of persons applying to regular practitioners, who are acquainted with the situation of the blood-vessels, and not employing, as is too frequently the case, ignorant and unskilful pretenders, for the performance of this important operation: soon after the injury has been committed the vein which immediately communicates with the wounded artery, begins to swell, and gradually to enlarge. Upon pressure, the tumour disappears, because the blood contained in it is pushed forwards in its circulation to the heart; and when large, there is a singular tremulous motion, attended with a hissing noise, as if air were passing through a small aperture.

Anethum Fœniculum, L. See COMMON FENNEL.

ANGEL, a messenger: also the name of an ancient gold coin in England, so called from the figure of an angel upon it. It weighed four pennyweights.

ANGELICA, is a plant of which there are seven species, though only two of them may be ranked among the indigenous.

1 *Angelica Archangelica*, L. or the Garden Angelica, is a large umbelliferous plant. An accurate botanical description and delineation of it may be seen in Dr. WOODVILLE's *Medical Botany;* vol. i. p 138. pl. 50. The stalk of this magnificent plant, when properly cultivated in a moist soil, rises to the height of seven or eight feet; its flowers are of a greenish white colour, or sometimes yellow.

Every part of this useful vegetable, the root, stalk, leaves, and seeds, partake of the aromatic properties; whence the Germans denominate it angel-root, or breast root, being one of the most spicy plants of European growth. Its resinous root, and the seeds, were formerly esteemed in medicine, and the former, when fresh, affords by distillation a strong and fragrant spirit, and an essential oil, in the proportion of a whole drachm, and upwards, from one pound. A tincture made of one ounce digested in twelve ounces of proof spirits, yields, on evaporation, two drachms, of a very pungent and spicy extract.

2. *Angelica Sylvestris*, L. or Wild Angelica, is a much smaller plant, of a thinner and less succulent stem than the former. It grows in marshy woods and in hedges, flowers in June or July, and is represented in GERARD's *Herbal*, 999. 1.

Cattle are exceedingly fond of eating the fresh spring leaves of the wild angelica, which to them are a good cleansing and strengthening medicine: bees visit its white flowers, and extract from them a more balsamic honey. Hence its growth should be encouraged, and even artificially promoted, especially as it is one of those plants which have lately been used with success as a substitute for oak-bark, in tanning leather, and particularly in preparing a kind of morocco from sheep, calf, and goat-skins.

Lastly, DAMBOURNEY asserts, that, from the leaves of the last mentioned species, he produced a beautiful and permanent gold colour, in dying wool properly prepared by a solution of bismuth.

We have some species of angelica in the United States; a. *spinosa*, a. *atro-purpurea*, or purple angelica; a. *lucida*, or shining; a. *sylvestris*, or wild angelica. The latter dyes a good yellow.

ANGER may be defined to be a violent passion of the mind, arising from a sense of personal injury and attended with an ardent desire of revenge.

It is either deliberative or instinctive; in the latter case, it is rash and precipitate, and blindly operates, regardless of the present, or of future consequences; in the former it anticipates the moment of revenge, and meditates retaliation. It is not always, however, a selfish passion, since it is as frequently excited by injuries offered to others as to ourselves, and is often the distinguishing characteristic of a susceptible and vigorous mind.

Indulged to excess, and excited by every petty provocation, it becomes habitual, and is sometimes productive of the most fatal effects. Independent of its moral consequences, excessive anger produces spasmodic contractions, and stagnation in the liver and its vessels; and, by these means, renders them schirrous, often generating stones and gravel in the gall-bladder and biliary ducts When accompanied with affliction, it usually occasions paleness of the countenance, palpitation of the heart, faltering of the tongue, trembling of the limbs, and jaundice. When the hope of revenge

is the predominant feature in anger, it causes violent commotions of the whole system, strong pulsation of the arteries, and a quick circulation; the vital spirits flow rapidly and irregularly through the whole body; the muscles are contracted, and some of them appear almost palsied; the cheeks are flushed, eyes sparkle with additional lustre, and the whole frame feels unusual animation, and a desire of motion.

Anger is particularly injurious to infants, who, from the sensibility of their frames, are extremely susceptible of this passion, and are sometimes so severely affected as to die suddenly in convulsions, or to retain, ever after, an imbecility of mind and body, arising from its powerful impression. Persons of an irritable habit are more frequently liable to its attacks; hence it generally appears in individuals who are troubled with nervous, hysterical, and hypochondriacal complaints. Those of a hot and dry temperament, of strong black hair, and great muscular strength, are likewise much exposed to its influence.

We ought, as rational agents, to beware of encouraging such destructive emotions; for it is certain, that men and women, possessing an irascible temper, generally die of pulmonary consumptions; and young persons, especially females, should be informed, that independently of its moral turpitude, it deforms the face, steals the rose from the cheek of beauty, and not only tends to extinguish the most tender affections, but sometimes even produces aversion.

On its first approach, persons subject to the invasion of this turbulent passion, should as much as possible divert their attention from the cause, by an application to some other object. A propensity to anger is increased by want of sleep, stimulant food, spices, wines, and such things as have a tendency to inflame the blood. Hence they ought to make use of diluent, acidulated, and gently aperient drink; and in every respect observe the most rigid temperance: they should allow themselves more sleep, employ the luke-warm bath, and indulge the eating of fruit, butter-milk, whey, vegetable aliment, &c.

ANGLE, in geometry, the opening, or mutual inclination, of two lines, or of two or more planes, meeting in a point called the vertex, or angular point.

The most general division of angles is, into plane, spherical, and solid.

Angle, a plane, rectilineal, is the inclination of two straight lines to one another, which meet together, but are not in the same straight line.

Angle, spherical, is an angle formed on the surface of a sphere by the intersection of two great circles; or, it is the inclination of the planes of the two great circles.

The measure of a spherical angle, is the arc of a great circle of the sphere, intercepted between the two planes which form the angle, and which cuts the said plane at right angles.

Angles, solid, is the mutual inclination of more than two planes, or plain angles, meeting in a point, and not contained in the same plane; like the angles or corners of solid bodies.

Angles are sometimes denoted, or named, by the single letter placed at the angular point, and sometimes by three letters, placing always that of the vertex in the middle. The former method is used when only one angle has the same vertex; and the latter method is necessary when several angles have the same vertex, to distinguish them from one another.

Angles in mechanics. 1. Angle of direction, is that comprehended between the lines of direction of two conspiring forces. 2. Angle of elevation, is that which is comprehended between the line of direction, and any plane upon which the projection is made, whether horizontal or oblique.

Angle of incidence, in optics, the angle which a ray of light makes with a perpendicular to that point of the surface of any medium on which it falls; though it is sometimes understood of the angle which it makes with the surface itself.

Angle of refraction, now generally means the angle which a ray of light, refracted by any medium, makes with a perpendicular to that point of the surface, on which it was incident; but has sometimes been understood of the angle which it makes with the surface of the refracting medium itself. It is a constant law of refraction that the ratio of the sines of incidence and refraction, is a fixed ratio, whatever be the obliquity of the incident ray, the media remaining.

Angles, in fortification, are understood of those formed by the several lines used in fortifying, or making a place defensible.

ANGLING, among sportsmen, is the art of fishing with a rod, to which are fitted a line, hook, and bait. The season for this amusement commences about the month of June, and the proper hours are, at the dawn of day, and about three o'clock in the afternoon; at which times the fish, in ponds and small rivers, are accustomed to feed. Easterly winds afford but little sport to the angler; for those blowing from the south are the most conducive to his purpose; and a warm, but lowering day, is of all others the most propitious. A cloudy day following a bright moonlight night, is always an auspicious omen; as the fish do not love to seek for food in the moon-shine, and are, therefore, always hungry the next morning. The observation of small fish, confined in a jar, either refusing or taking food, affords a good criterion of the most convenient season.

Upon taking his stand, the angler should shelter himself under some tree or bush, or remain at least so far from the brink of the water, that he may just discern his float; as the fish are timerous, and easily frightened away. The rod must be preserved in a moderate state, neither too dry nor too moist, as in these cases it will be either brittle or rotten. Various baits are used, such as worms, artificial flies, paste made of boiled cheese, beat up with powdered quick-lime, &c. When these last are employed, it will be proper to cement them with a little tow, and rub them over with honey. The best method of using the fly, is down the current of the stream; and half a dozen trials will be sufficient to determine, whether the fish will take or refuse the bait. With respect to the habitations most congenial to particular kinds of fish, it deserves to be noticed, that *bream* are to be found in the deepest and most quiet places; *eels*, under the banks of rivers; *perch* and *roach*, in a pure, swift stream; *chub*, in deep, shaded holes; and *trout*, in clear, rapid brooks. Situations abounding in weeds, or old stumps of trees, often harbour numbers of fish, which bite freely; but there is great hazard of breaking the line, or entangling the hook. The openings of sluices and mill-dams always invite them up the current, to seek for the food which is conveyed with the stream; and angling in these places is generally successful.

Various methods are suggested, by those who treat on angling, for attracting fish to the spot. In standing waters, this is by no means difficult: a quantity of grains, chopped worms, or other food, is thrown by way of invitation. In small running streams, those to whom they belong can easily confine their fish to any given part; but, in rivers, the following expedient is employed: a box made of tin, and capable of holding several hundred worms, is to be procured. It must be pierced with holes sufficiently large to permit the escape of the worms, and furnished with a weight that will cause it to sink, and a line to draw it back at pleasure. This being lowered into the water, the worms will crawl out, the fish assemble, and the angler, who throws in his hook higher up the stream, and suffers it to be carried down with it, if there be no pike in the neighbourhood, succeeds in his design.

ANIMAL. If the term be disputed, it is very difficult to define what classes of created things are strictly animal: in a general sense, it is applied to every thing that is supposed to be alive to the sensations of pain and pleasure. Under the name of animal, therefore, are included men, quadrupeds, birds, fishes, reptiles, and insects. Animal literally means a *living thing*: but plants live. Linnæus has formed a climax of the grand departments of creation: stones grow, vegetables grow and live: animals grow, live, and feel.

[Perhaps the following would be a more accurate description.

Animals live: they grow from their birth to adult age by means of food taken into the stomach, digested and assimilated: from that age they gradually decline in health and strength till they die of old age or of disease: they have the power of voluntary locomotion by means of a system of muscles set in motion by a system of nerves: they have sensation and feeling, sometimes attended, when in excess, by pleasure or by pain, in consequence of a nervous system, by means of which they feel.

Vegetables live: they grow to adult age, to a certain size, by means of food taken in by their roots and leaves, digested and assimilated: from that age they gradually decline in health and strength till they die of old age or of disease: they have no power of voluntary locomotion because they have not (so far as is known) any system of nerves or

voluntary organs of motion; hence they are fixed to one place, where they grow, live, and die, unless forcibly removed: they have no feeling or sensation of external objects, or internal impressions of pleasure or of pain, for want of a nervous system as the organ of sensation.

Minerals neither live or grow by means of food taken in or assimilated: they have no power of locomotion, or of sensation: they sometimes increase in size by accidental apposition of similar parts. T. C.]

ANIMAL FLOWER (*Actinia Sociata*) from its supposed property of stinging, was formerly called Sea-Nettle, or Sea-Anemone, but by late English writers has received its present name. This singular animal is of a tender, fleshy substance, which consists of many tubular bodies, gently swelling towards the upper part, and terminating like a bulb, or very small onion: its only orifice is in the centre of the uppermost part, surrounded with rows of tentacles, or claws, which when contracted, appear like circles of beads. This opening is capable of great extension, and it is amazing to see what large fish some of them can swallow, such as muscles, crabs, &c. When the animal has scratched out the fish, it throws back the shells through the same passage. From this aperture likewise, it produces its young ones alive, already furnished with little claws, which they extend in search of food, as soon as they are fixed. At low water, they are found on the rocky coasts of Sussex and Cornwall, attached in the shallows to some solid substance, by a broad base, like a sucker. This base is worthy of notice, the knobs observable on it, are formed into several parts, by its insinuating itself into the inequalities of rocks, or grasping pieces of shells, part of which frequently remain in it, covered with the fleshy substance. By its assistance, they are enabled to preserve themselves from the violence of the waves, and withstand the fury of a storm. Animal flowers very much resemble the exterior leaves of the anemone, and their limbs are not unlike its shag, or inner part. They are said to possess, in an extraordinary degree, the power of reproduction, so that to multiply them at pleasure, nothing more is necessary than to cut a single one into several pieces.

The reverend Griffith Hughes, in his natural history of the island of Barbadoes, gives the following account of a very curious object in nature, which he calls the animal-flower: "The cave that contains this animal is near the bottom of a high rocky cliff facing the sea, in the parish of St. Lucy. Its bottom forms a natural basin of about sixteen feet in breadth; and when the wind is high, and at a certain point, the sea breaks into it, and it is thus kept full of water, which, with the exception of a small quantity that oozes from the roof of an anterior cavern, is entirely salt. In the middle of the basin, rises a small rock, which is always under water. Round the sides of this stone, at different depths, but seldom more than eighteen inches below the surface, are seen, at all seasons of the year, fine radiated flowers of a pale yellow, or bright straw-colour, slightly tinged with green. They have a circular border of petals, thickly set, and resembling, both in shape and size, the single garden-marygold. The whole of this seeming flower, however, is narrower at the *discus*, or central circle, round which the leaves adhere, than any other flower of that kind. I attempted to pluck one of these flowers from the rock to which they are always fixed, but found, to my surprise, that I was unable to touch it. When my fingers were under water, and had approached within two or three inches of their object, it immediately contracted, closed its yellow border, and retreated into the hole from which it issued. If left undisturbed for the space of about four minutes, it gradually returned into sight; expanding, though at first with caution, its seeming leaves, and, at length, re-displaying its mysterious bloom: whenever my hand had nearly reached it, it constantly recoiled; and the effect was the same if I used a cane or slender twig. These were strong characteristics of animal life: yet, as its form and want of local motion classed it among vegetables, I was for some time in suspense, and imagined it to be an aquatic sensitive-plant. Though its contraction to avoid the touch was performed with more quickness than by any plant that I had seen of that description, yet, its seeming leaves might be, and in reality were, of a far thinner and more delicate texture than those of any known flower; and the weight of the water, so much greater than that of air, might contribute to this celerity. With respect to the extreme thinness of the petals, I had once an opportunity of ascertaining the fact. for though I

could not, by any means, contrive to take or pluck from the rock one of these animals entire, I was fortunate enough to succeed, after waiting for some time with a knife near the mouth of a hole, in cutting off two deceptious leaves. When out of the water they retained, for a short time, their shape and colour; they were composed of a membrane-like substance, surprisingly thin; and they soon shrivelled up and decayed. I was inclined, then, till a subsequent visit decided my opinion, to consider this flower as a sensitive-plant: but I now plainly saw four dark-coloured resemblances of threads, something like the legs of a spider, rising out of the centre of the leaves. Their quick spontaneous motion, from one side to the other of this circular border of seeming leaves, which, in reality, were so many arms or feelers, and their closing together like a forceps, as if they had hemmed in their prey, which the yellow border likewise soon surrounded and closed to secure, fully convinced me that it was a living creature. Its body, at a distance, appears to be about as big as a raven's quill, and of a blackish colour; the one end sticking to the rock, the other extending a very small distance from it; and incircled with a yellow border, as above described. Now, since the same goodness and wisdom which give being to creatures, preserve them in that being or existence by ways and means as wonderful as their creation itself, we may conjecture, with some probability, the intention of the amazing providence of God in induing this animal's arms or feelers with a fine yellow colour, and ordering it to differ, in this particular, from the several tribes of fungous animals that are usually found cleaving to the rocks in the sea. These latter, may be fed with spawn, or other animalcules, which the flux and reflux of the waves throw in their way; and, in this case, there is no need of any uncommon means for enticing their prey, even supposing it to be animal, within their reach: but still water, like that in the cave, will not, in the same manner, of itself convey this supply of food. Here then, some extraordinary temptation is requisite, in order to allure the prey within the reach of the stationary animal that is to be fed. To this end, the fine brilliant colour that has been described may have been given to the creature in question: for, as rays of light, or what resembles them, are inviting to almost every thing that lives, the beautiful border may serve as a decoy. All the species of this creature are not, however, of the same colour In the uppermost part of the same rock, there are innumerable clusters of what are provincially called *water-bottles*, very much resembling scattered clusters of unripe grapes: the outside consisting of a bluish skinny tegument, like that of a grape, and the inside filled with water, in a somewhat turbid state. Among these are a great number of the animal-flowers. Like the yellow ones, they are fixed to the rock, not in holes, but sticking to the surface, among the water-bottles, and generally not more than nine inches under water. The leaves, or rather feelers, of these, are of a greyish-purple colour, variegated with black spots. Other animal-flowers, of a bluish green colour, some of which are not larger than an English twopenny piece of silver, grow in clusters upon the rocks. None of these latter sorts are so sensitive as the yellow: and they vary from each other. Having plucked one of those growing among the water-bottles, I found the body, which was about an inch long, to possess a sensible vermicular motion. The feelers, likewise, which decorated one end of it, when exposed to the air, shrunk up, and remained as lifeless; but as soon as the whole was dipped in the water, they would, as it were, assume a new life, and appear again in their full vigour Soon after the discovery of these surprising animals, a great number of people came to view them. but as this was attended with some small inconvenience to the person through whose lands they were obliged to pass, he, to get rid of the company resolved to destroy this object of their curiosity. In order to do this effectually, he took a piece of iron, prepared for the purpose, and carefully bored and drilled every part of the holes in which these seeming flowers were bred; but to his great surprise, in a few weeks, they appeared again, issuing out of the same holes.—Let us here, for a while, stop and consider whether our much-boasted reason can find out how even a latent principle of life can be preserved after the whole organic body is torn in pieces? When we see this animal, in a short time after its apparent destruction, resuscitate, and appear in its former proportion, beauty, and life, can we, after such an ocular demonstration of so astonishing a

change in a creature destined for this life only, and removed, in all appearance, but a few degrees from the vegetable creation, any longer entertain doubts about the reasonableness of another doctrine of a far greater consequence? And as every past age has been, so, undoubtedly, every future will be blest with some surprising new discovery of the unsearchable power and wisdom of God."

ANIMAL FOOD. See FOOD.

ANIMAL FUNCTIONS, are those by which the materials, that constitute and support the bodies of animals, are prepared and supplied. The principal of these functions are the following—circulation, digestion, nutrition or assimilation, respiration, and secretion, which are employed in producing animal matter from the substances that compose it. But, besides these, there are others, which though they do not act chemically, like the foregoing, are in many animals subservient to various important purposes.

ANIMAL HEAT. Heat is essentially necessary to life. That of a man in health is from about 94° to 100° of Fahrenheit. It appears to depend upon the absorption of oxygen in the lungs. [Probably also on galvanic processes within the body; and on the solidification of the fluids by assimilation T. C]

ANIMAL KINGDOM, an expression which includes all organised living bodies, capable of sensation and voluntary motion: and essentially differing from plants and minerals, which have neither organs of sense, nor the power of locomotion.

Another circumstance affords a criterion to distinguish animals from vegetables and fossils; which, in many instances, so closely border on each other, especially the two former, that naturalists have frequently hesitated, to which of these kingdoms certain marine productions, for instance, the polypus, may with the greatest propriety be referred. See VEGETABLE and MINERAL KINGDOMS. The circumstance alluded to is the following:

1. All bodies which grow *from without*, that is, derive their origin and increase in such manner as to approximate to themselves certain foreign and inert particles, and are incapable of motion, consequently inanimate, are called *minerals* or fossils.

2. Bodies having no aggregate form but growing *from within*, being provided with certain tubes or vessels adapted to the circulation of fluids, which afford them nourishment, and promote their extension, may be said to enjoy a passive life, and are therefore termed *vegetables*, or plants.

3. Living creatures which likewise grow *from within*, and are endowed not only with those vessels, but also with organs of sense, the faculty of locomotion, and the *power of distinguishing one external object from another*, yet do not enjoy the advantages of reason, are generally denominated *animals*.

Hence arise the three divisions of natural bodies, consisting of the ANIMAL, VEGETABLE, and MINERAL KINGDOMS.

I. *Mamillary Animals* are furnished with a heart of two ventricles and two auricles; have a red, warm blood, breathe through lungs, produce living young ones, and suckle them with their milk.

II. *Birds* likewise have a heart of four cavities, red, warm blood, respire through lungs, deposit eggs, and are uniformly provided with beaks and wings.

III. *Amphibious Animals* possess a heart, but it has only one ventricle and one auricle; they have red, but colder blood than the latter, and live alternately on land and in water.

IV. *Fishes* have also a heart with two cavities, red, cold blood, are provided with gills, and can subsist only in water.

V. *Insects*, or creatures, that have a heart with one ventricle, but no auricle; cold, and generally white blood; are furnished with *antennæ*, or feelers, on their heads, and undergo a change of their nature and appearance, previous to their dissolution.

VI. *Worms* also have a heart with one ventricle, without an auricle; cold, white blood; are provided with *tentacula*, or feeling threads, but undergo no change.

Conformably to this division, we shall give a more or less detailed account of the different domestic and wild animals, which, either from their peculiar nature, habits, and form, deserve to be noticed in this work, consistently with its original plan; or which, in an economical view, contribute to relieve our necessities: while a more accurate knowledge of useful creatures cannot fail to improve the mind, and gratify the laudable curiosity of an intelligent reader

ANIMAL LIFE. It is difficult to mark the line, where vegetable life ends, and animal life begins. Animal life may be described that kind of existence, which enables its possessor to follow the dictates of its own will; renders it susceptible of pleasure both through the medium of the senses and of the imagination; subjects it, at the same time, to a similar sensibility to pain; endows it, in short, with a twofold being. The plant, as we suppose, is invigorated by the approach of spring without enjoying any attendant pleasure; whereas, the smallest fly receives from the beams of the sun, a mental as well as corporeal gratification.

ANIMAL MAGNETISM, a pretended science, the temporary reputation of some impudent pretenders to a knowledge of it, is one among the numerous proofs of the imbecility of the human understanding. The reader will clearly apprehend, that it supposes an attractive power by means of which the animal economy may be operated upon. It originated with father Hehl, a German philosopher, who, in 1774, strongly recommended the use of the magnet in medicine: but the founder of the imposture in question, was M. Mesmer, a physician of the same country, who, leaving his native land, where he obtained but little credit, flourished in a most extraordinary manner at Paris, about the years 1778 and 1779. M. Deston, a pupil and coadjutor of Mesmer, is said to have realised 100,000*l.* sterling by his practice; and this person explained the principles of his art in the following manner. I Animal magnetism is an universal fluid, constituting an absolute plenum in nature, and the medium of all natural influence between the celestial bodies, and between the earth and animal bodies. II. It is the most subtile fluid in nature; capable of a flux and reflux, and of receiving, propagating, and continuing, all kinds of motion. III. The animal body is subjected to the influences of this fluid by means of the nerves, which are immediately affected by it. IV. The human body has poles, and other properties, analogous to the magnet. V. The action and virtue of animal magnetism may be communicated from one body to another, whether animate or inanimate. VI. It operates at a great distance, without the intervention of any body or medium. VII It is increased and reflected by mirrors; communicated, propagated, and increased by sound; and may be accumulated, concentrated, and transported. VIII Notwithstanding the universality of this fluid, all animal bodies are not equally affected by it; on the other hand, there are some, though but few in number, the presence of which destroys all its effects. IX. By means of this fluid nervous disorders are cured immediately, and others mediately; and its virtues, in short, extend to the universal cure and preservation of mankind. —A similar imposture was practised with success, many years in London, by an American, who rightly appreciating the credulity of our countrymen, sold for five guineas a couple of pieces of metal intrinsically not worth as many farthings, under the alluring title of METALLIC TRACTORS. The inventor having realised, it is supposed, a good fortune, returned to his own country, laughing at the folly of those, whom he had so easily duped.

ANIMAL MATTER. Under this term are comprehended all the various kinds of substances, of which animal bodies are composed; not so much, however, with regard to the radical principles of which they consist, as to those particular and exclusive forms, in which they exist, throughout all the tribes of the animal kingdom, as far as they have been subjected to examination.

ANIMAL MOTION: various conjectures have been broached with a view to account for the origin of this important function in the animal economy: but, like most other springs of action, arising from a *first cause*, it is only in a slight degree cognisable to our senses, by its evident, mechanical effects.

Anatomists have, indeed, in their dissections demonstrated, that the contraction of the muscles causes motion, but by what peculiar process, or how produced, remains still doubtful, and involved in obscurity. Among other hypotheses advanced concerning animal motion, there prevails an opinion, that it is occasioned by an impulse or irritation of the nerves; which, communicating with all parts of the body, produce muscular contraction, and consequent motion, either to a part or to the whole of the frame, in proportion to the force or frequency of the impression. The difficulty of comprehending, how mere impulse, or irritability of the nervous system, should alone be suffi-

cient to produce such powerful effects, as often follow muscular contraction, has induced others, while they admitted this principle as a *first* cause of animal motion, to believe in the intervention of some other matter, which is the more immediate agent, in effecting a closer contact of the muscular fibres, and greater energy during the time of their contraction.

The existence of such a subtle matter, as may be capable of performing these wonderful phenomena, has been considered as highly probable; and is supposed to reside in the medullary substance of the nerves. [Late experiments lead us to look toward galvanism for the source of nervous energy and muscular motion. T. C.]

ANIMALCULE, in its general acceptation, merely signifies a little animal, but is usually applied to those living objects, which are invisible to the naked eye, and can be discoverable only by the assistance of glasses.

By the invention of the microscope, we have become acquainted with a variety of animals, which, from their minuteness, would otherwise have escaped our observation; and there is reason to believe that myriads of them exist, both in the atmosphere and on the earth, which elude the human eye, even when assisted by this instrument. They are of various kinds, and to be met with in different natural bodies. By the assistance of magnifying glasses, they may be seen in water, vinegar, beer, milk, &c. they are also found in corn, paste, flour, and other farinaceous substances

ANIMALCULE, is a term which may be applied to any living creatures, whose existence, cannot be discovered without the aid of glasses. Naturalists suppose, and with great reason, that there is a farther order of animalcules which escape the cognisance of even the best microscopes. The naked eye takes in a series from the elephant to the mite: at this point commences a new class of animals, which comprehends all those from the mite to those many millions of times smaller than the mite; and this class cannot be said to be wholly discovered, unless the microscope be also said to have attained its greatest possible perfection.

ANIMATION, is that property which distinguishes living from dead or inanimate matter, and is frequently used to denote the principle of life itself. Strictly speaking, however, it is that which imparts energy and activity to the vital powers; and these may still continue, when animation is either suspended or destroyed. It is capable of modification, and varies in its proportion at particular times, and in different persons.

In a moral or intellectual sense, it denotes an elevated state of the mind, in consequence of the predominance of some powerful passion, such as love, anger, ambition, &c. or the vigorous application of stimuli, such as wine, spirits, air, exercise, &c

Of those causes which produce it in the highest degree, the chief and most essential is *air*; given either in its purest state, or in certain combinations with other gases, its effects are so singular, as to resemble those which were formerly said to be produced by magic.

Animation may be either *diminished*, or *suspended*, without injuring or destroying the living principle. The former effect may be seen in those persons who have suffered from long and close confinement in prisons, hospitals, crowded and heated assemblies, as well as in fevers, consumptions, and other chronic complaints. In these cases, a proper and moderate application of the necessary stimuli, such as air, exercise, a nourishing diet, &c. will generally accomplish, either its partial or complete restoration. Of the latter, various instances have lately happened: persons who were accidentally suffocated or drowned, have, by timely and proper means (particularly those recommended by that excellent institution, the *Royal Humane Society*,) been successfully re-animated, when life itself seemed on the eve of departing.

Among those causes which principally tend to preserve and increase animation, are temperance, gentle exercise, nourishing diet, wine, moderate gratifications, and constant activity, both corporeal and mental.

Various methods have, at different times, been recommended to restore animation when suspended, either from suffocation or drowning. In Spain, they first lay the body with its head downwards, near a fire, till it begins to feel warm, and eject water from the *trachea* or windpipe; they then foment the whole breast, and seat of the heart, with spirits of wine, brandy, or bread dipped in strong wines By this means, if the vital principle be not extinct, the circulation of the blood is usually re-

stored. The French Academy advise tobacco-smoke to be forcibly injected into the anus and lungs, after which a vein to be opened in the arm and foot: it is asserted, that by this method, persons who have lain many hours under water, have been happily resuscitated.

In the *Journal Historique sur les matieres du tems*, for Dec. 1758, a case is related by Dr. Du Moulin, who succeeded in recovering a young woman, after she had lain for several hours under water. All pulsation having ceased, he considered it as a desperate case, and was induced to try a method he had frequently observed to be successful with flies and other insects, which, when drowned or apparently dead, had been revived by half burying them in ashes or salt. He accordingly ordered a quantity of dry ashes to be strewed, about three inches deep, on a bed: upon this layer his patient was placed, and another, about two inches in depth was spread over her. The head was covered with a cap containing some of these ashes; and a stocking filled with the same material was placed round her throat. Blankets were then laid on the bed; and in half an hour her pulse began to beat; after which she quickly recovered. Dry salt may be used as a substitute.

In cases of apparent death, from drowning, it is necessary to rub the breast and temples, and all the other parts with warm cloths. Bladders filled with warm water, or bricks heated and wrapped in flannel, should be applied to the soles of the feet, under the arm-pits, and between the thighs.—When symptoms of returning animation appear, a few ounces of blood may be taken from the arm.

Farther directions for the management of bodies in that unfortunate situation, we propose to communicate under the articles of Drowning, Suspension by the cord, Lightning, &c.

As a proof of the success which has attended the exertions of medical men in this country, who have liberally co-operated with the benevolent designs of the *Royal Humane Society*, under the immediate patronage of our august Sovereign, we shall adjourn this subject, in the words of our worthy friend, the philanthropic Dr. Hawes, a gentleman whose integrity and disinterested activity deserve equal commendation: "Animation (says this noble veteran), has been given to thousands since 1774, *the birth* of our life-saving labours."

ANNALS, a species of history, wherein events are related in the chronological order they happened. It differs from a perfect history, in being only a mere relation of what passes every year, as a journal is of what passes every day; whereas history relates not only the transactions themselves, but also the causes, motives, and springs of such actions. Cicero informs us that the Pontifex Maximus, in order to preserve the memory of events, wrote what passed each year on tablets, which were exposed to public inspection in his own house. These tablets were called annales maximi; hence the writers who imitated this method of writing were stiled annalists.

ANNEALING, by artificers called *nealing*, is a part of the process of making, or finishing, glass; and consists in placing bottles and other vessels, while hot, in a kind of oven or furnace, where they are suffered gradually to cool.

The difference between unannealed, and annealed glass, is very remarkable. When a glass vessel that has not undergone this process is broken, it often flies into a small powder with a violence apparently disproportionate to the stroke which it received. In general, it is in greater danger of being broken from a very slight blow, than from a more considerable one. Such vessels will often resist the effects of a pistol bullet dropt into it, from the height of two or three feet, yet a grain of sand falling into it, will break it into small fragments. This sometimes takes place immediately on dropping the sand into it, but the vessel will frequently remain apparently sound, for several minutes after, when, without the least touch, it will suddenly fly to pieces. If the glass be very thin, this effect does not take place, and on the contrary, it seems to possess all the properties of such as are annealed.

Glass is one of those bodies which increase in bulk, on passing from a fluid to a solid state. When it is allowed to crystallise regularly, the particles are so arranged, that it has a fibrous texture; but when a mass of melted glass is suddenly exposed to a cold temperature, the surface crystallises, and forms a firm shell round the interior fluid parts, by which they become solid, and are prevented from expanding.

By the process of annealing, the glass is preserved for some time in a state approaching to fluidity; the heat increases the bulk of the crystallised part, and renders it so soft, that the internal fibres have an opportunity of expanding and forming a regular crystallisation.

A similar process is now used for rendering kettles, and other vessels of cast iron, less brittle; which admits of the same explanation as that above stated. The greater number of metals diminish in bulk when they pass from a fluid to a solid state. Iron, on the contrary, expands.

ANNUITY, implies a sum of money payable yearly, half yearly, or quarterly, to continue for a certain number of years, for life, or for ever.

An annuity is called an arrear, when it continues unpaid after it becomes due; and is said to be in reversion, when the purchaser, upon paying the price, does not immediately enter upon possession: the annuity not commencing till some time after.

The interest upon annuities may be computed either in the simple or compound manner. But the latter, being most equitable, is generally preferred.

In the first class, viz in those which extend for a limited period, the principal considerations are the annuity, rate, and time being given to find the amount, or sum of yearly payments, and interest. These are readily ascertained, by a series of algebraical calculations.

In freehold estates, the principal circumstances to be attended to, are:

1. The annuity or yearly rent.
2. The price or present value; and,
3. The rate of interest.

The value of life-annuities is determined by comparative observations and calculations derived from the bills of mortality. Several computations have been made for this purpose; the most esteemed of which are those by Dr. Halley, Mr. Simpson, and M. De Moivre.

Breslaw, the capital of Silesia, being a central place, and not much crowded, was fixed upon by Dr Halley, who had recourse to the bills of mortality, when he composed his table. He selected 1000 persons, all born in one year, and observed, how many of these remained alive every year from their birth, to the extinction of the last; and, consequently, ascertained the number which died in each year, as follows:

Age	Persons living.	Age	Persons living
1	1000	47	377
2	855	48	367
3	798	49	357
4	760	50	346
5	732	51	335
6	710	52	324
7	692	53	313
8	680	54	302
9	670	55	292
10	661	56	282
11	653	57	272
12	646	58	262
13	640	59	
14	634	60	
15	628	61	
16	622	62	
17	616	63	212
18	610	64	202
19	604	65	192
20	598	66	182
21	592	67	172
22	586	68	162
23	579	69	152
24	573	70	142
25	567	71	131
26	560	72	120
27	553	73	109
28	546	74	98
29	539	75	88
30	531	76	78
31	523	77	68
32	515	78	58
33	507	79	49
34	499	80	41
35	490	81	34
36	481	82	28
37	472	83	23
38	463	84	20
39	454	85	15
40	445	86	11
41	436	87	8
42	427	88	5
43	417	89	3
44	407	90	1
45	397	91	0
46	387		

As there is allowed to be a greater disparity between births and burials in London than in any other place, Mr. Simpson selects 1280 persons, all born in the same year, and records the number remaining alive each year, till none be left, in order to form a table particularly suited to this populous city.

The following is Mr Simpson's table on the bills of mortality, at London

Age.	Persons living.	Age.	Persons living.
0	1280	48	220
1	870	49	212
2	700	50	204
3	635	51	196
4	600	52	188
5	580	53	180
6	564	54	172
7	551	55	165
8	541	56	158
9	532	57	151
10	524	58	144
11	517	59	137
12	510	60	130
13	504	61	123
14	498	62	117
15	492	63	111
16	486	64	105
17	480	65	99
18	474	66	93
19	468	67	87
20	462	68	81
21	455	69	75
22	448	70	69
23	441	71	64
24	434	72	59
25	426	73	54
26	418	74	49
27	410	75	45
28	402	76	41
29	394	77	38
30	385	78	35
31	376	79	32
32	367	80	29
33	358	81	26
34	349	82	23
35	340	83	20
36	331	84	17
37	322	85	14
38	313	86	12
39	304	87	10
40	294	88	8
41	284	89	6
42	274	90	5
43	264	91	4
44	255	92	3
45	246	93	2
46	237	94	1
47	228	95	0

But these tables, however perfect they may be in themselves, must be considered only as probable conjectures, founded on the usual period of human life, which is estimated as follows:

1. The probability that a person of a given age may live a certain number of years, is measured by the proportion which the number of persons living at the proposed age bears to the difference between the said number, and that of persons existing at the given ages.

Thus, if it be required to know what chance a person 40 years of age may have to live seven years longer, the reader should refer to Dr. Halley's table, and from 445, the number of persons living at 40 years of age, subtract the number of persons living at 47 years of age, and the remainder being 68, will be the number of those who have died during those seven years. The probability, that the person in question will live these seven years, is in the proportion of 377 to 68, or nearly as 5½ to 1. By Mr. Simpson's table, the chance is somewhat less than that of 4 to 1.

If it be desirable to ascertain the year, which a person of a given age has an equal chance of attaining, the inquirer ought to find half the number of persons living at that given age, in the tables; and the year required will appear in the column of ages.

The premium of insurance upon lives may also, in some degree, be regulated by these tables, as follows:

The chance which a person of 25 years has to live another year, is, by Dr Halley's tables, as 80 to 1; but the chance that a person of 50 years has to live a year longer, is only 30 to 1; and consequently the premium for insuring the former ought to be the premium for insuring the latter for one year, as 30 to 80, or as 3 to 8.

Life annuities are commonly bought or sold at a certain number of years purchase. The value of an annuity of 1*l* for an age of 50 years, at 3 per cent. interest, is about 12*l*. 10*s*. or twelve and a half years' purchase.

Among those who have written on this subject, none is more deservedly celebrated than Dr Price, the author of *Observations on Reversionary Payments, Annuities*, &c. published in 1771; and his curious remarks on this subject, inserted in the LXVth vol. of the *Philosophical Transactions*, for 1775, p. 424, are well worthy of perusal and attention.

In our opinion, life annuities, when granted by individuals whose property is already involved, or who by such an expedient injure the just expectations of their relatives, ought not to be connived at in a well regulated state. Viewed in a commercial light, this species of gambling, in a certain degree, resembles the furious rage for the hazard or faro table; to which all those adventurers and avaricious money lenders generally resort, who are anxious

to amass large sums of money, which, by moderate legal interest, could not be realised. See farther, LIFE ANNUITY.

ANODYNE, is a term applied to medicines which have a tendency to assuage pain. This desirable purpose may be attained in three different ways: 1 By *paregorics*, or such remedies as are calculated to ease pain; 2. By *soporifics*, which relieve the patient by causing artificial sleep; and 3. By *narcotics*, or such as stupify, by their action on the nervous system.

This division, though sanctioned by general authority, is very imperfect; and we shall attempt to explain the subject in a manner, perhaps, more consonant with just principles of animal economy—not from the result, but from the cause by which a proper application of anodynes induces certain changes in the human body. In order to give a distinct view of the subject, we shall arrange them under three classes; namely,

I Such remedies as tend either to remove the offending cause, or prevent the part affected from receiving a sensible and painful impression, viz. in consequence of the amputation of a limb; the drawing of a tooth; the burning of parts either by the cautery, or by means of a red hot iron; the application of the tourniquet, a tight ligature, compresses, &c. To this class also belongs opiates, and other stupifying medicines, administered for the suspension of pain; but which may be justly termed, " poisons of the sensitive faculty." However liberally others may explain the effects of opium on the organs of the mind, we cannot avoid observing, that its operation on the *sensorium commune* is always attended with violence, and that so powerful a medicine ought not to be intrusted to the hands of those who are but little acquainted with its nature Nay, we are of opinion, that even medical men cannot be too careful in its exhibition; but far from wishing to deprecate the use of this invaluable drug, which cannot in the present state of medical science, be excluded from the list of *medicinal* substances, we shall here venture to suggest a few ideas respecting the propriety, and greater safety, of its external use.

In very painful wounds, excruciating rheumatism, contractions, and paralytic affections arising from frequent spasms and strictures, the *external* use of opium is both safe and beneficial, especially if combined with antispasmodic and emollient remedies, such as camphor, linseed oil, marsh-mallows, &c. These *alone* are frequently sufficient to relieve distressing pain, without the assistance of anodynes properly so called; as the latter generally determine the circulation of blood towards the head, and occasion giddiness, stupor, and a relaxation of the nerves. With the above additions, however, opium may be advantageously employed in the form of baths, fomentations, ointments, cataplasms, and particularly in *clysters*. See the article ABDOMEN, p. 2. *laudanum*.

When the pain is in the interior organs, and its seat cannot be precisely ascertained, or when it rises from causes which neither the patient nor physician can discover, we would prefer the following *anodyne liniment*, a timely application of which has frequently procured immediate relief: take one ounce of the dried leaves of the common henbane, or four ounces of the green plant, and half a pint of sweet olive oil, digest them near a fire for a few days, then express the leaves through a coarse piece of linen, filter the decoction, and preserve it in a vessel closely stopped. This preparation, if applied warm, or rubbed into painful parts, has, according to our own experience, proved of singular efficacy.

II. Those remedies which are calculated to change, suppress, or evacuate the *material* cause of pain, and are therefore the most rational, though unfortunately, not always within the reach of the medical practitioner. Thus, if the intestinal canal be obstructed, or the stomach clogged with acrid matter that cannot fail to produce violent colics, and other disorders, the principal aim will be to evacuate it by purgatives or emetics, and thereby not only cure the complaint, but, at the same time, save the patient's life, which by means of opiates, given either by the mouth or clyster, without such previous evacuations, would be exposed to imminent danger. Hence we are induced to express our opinion decidedly in favour of those who, from a conviction of the great importance of the trust reposed in them, seriously hesitate to employ anodynes, so long as there is a possibility of dispensing with such precarious remedies. But, in cases where the morbid matter cannot be expelled, a skilful practitioner will endeavour, at least, to deprive it of its activity, or to neutralise it, while in the human body. In this manner, pains arising from acrimonious humours, are relieved by

drinking bland, diluent, and saccharine liquors: from intestinal worms (though resisting every vermifuge) by remedies which destroy them before they are carried off by the fæces; from a pleurisy, by such means as resolve the stagnant fluids, and promote their circulation through the constricted capillary vessels: from stones in the bladder, if they be too large for expulsion, by the use of lime water, which tends to blunt their edges, &c. These illustrations, however, might be accompanied with a variety of practical hints and precautions, if we did not intend to reserve such observations, till we have occasion to treat of the different acute and painful diseases, under their respective heads

III. The last class of anodynes comprehends all those which, by exciting impressions and representations of a different kind, either counteract or subdue the pain. These are generally resorted to, when neither the affected organs can be locally relieved, the material cause removed, nor the senses stupified by narcotics. Hence physicians are frequently obliged to employ such expedients as may suppress the partial affections, by exciting feelings of a different nature, and perhaps to a more intense degree than those occasioned by the original complaint. These remedies, however, require equal ingenuity and precaution Thus, for instance, violent head-ach, tooth-ach, pains of the breast, &c. may be allevi-ated by blisters, or cataplasms made of onions, garlic, mustard seed with vinegar, horse radish, and similar stimulants; rheumatic and gouty affections, by early friction with flannel, which for many reasons, is preferable to a flesh brush. All these applications, nevertheless, ought to be maturely considered, previous to their use, with respect to the place, strength, and duration, of the stimulus.

To this class may also be referred, diversions of the mind; inclinations and passions artificially excited, in order to direct the attention of the patient to a different object: such expedients are frequently of excellent service, especially in chronic diseases, and to inveterate hypochondriacs In a similar manner, terror and anger sometimes instantaneously suppress the painful sensations of gouty and rheumatic patients. Thus, the pleasures of conversation, a country life, theatres, music, dancing, hunting, and similar amusements, are often more effectual anodynes than wine, brandy, or laudanum; the former agreeably cozen and delude the mind; the latter always, sooner or later, aggravate the complaint

On this subject Dr MEASE observes:—"The apprehensions expressed by Dr WILLICH, with respect to the bad effects of anodynes are in a great measure groundless; and the substitutes he recommends, will do more injury than the opium, by their inefficacy in relieving the system from violent pain, which an anodyne might soon dispel. Thus, in very violent colics it is always more advisable to take an anodyne, when first seized, and afterwards to purge, and bleed, if necessary. (See COLIC) In the head ach also, commonly termed *nervous*, but which most frequently is caused by affections of the stomach, 15, 20 or 30. drops of laudanum, taken on the first attack, will, nine times out of ten, remove the disease, which, with any substitute, might be protracted for two or three days; a cup of coffee, without sugar, will relieve the sickness and unpleasant sensations which commonly follow the use of opium. It must be acknowledged, however, that cases often occur where anodynes cannot be safely given internally, in consequence of the derangement they create in the system; in such cases, opium may be safely applied externally, in the form of laudanum, with great advantage; or the following prescription may be used:

Take opium in fine powder, half a drachm

Camphor, four grains.

Hog's lard, four scruples.

Olive oil, one drachm —Mix.

This mixture may be rubbed on the inside of the legs and thighs as often as the symptoms require In the course of this work, the various cases in which anodynes may be given with safety, shall be pointed out"

ANOTTA, is an elegant red colouring substance, prepared from the pellicles, or pulp, which surround the seeds of the Arnotto Tree, or *Bixa*, a native of South America.

According to LABAT, the Indians prepare an anotta far superior to that imported into Britain: it is of a bright, glossy, red colour, little inferior to CARMINE. For this purpose, instead of steeping and fermenting the seeds in water, they rub them with the hands, previously immersed in oil, till the pellicles are separated, and reduced to a clear paste; which is then scraped off with a knife, and exposed on a clean

leaf in the shade, where it is gradually dried

Anotta is chiefly used for imparting to wool or silk, a deep, though not permanent, orange hue. Considerable quantities of this dyeing drug are likewise employed in the colouring of CHEESE; and also as an ingredient in varnishes, for communicating an orange shade to the simple yellows. [It is soluble in spirits of wine and in alkaline salts, and is the basis of Scot's patent liquid nankin dye.—T. C.]

From the wax or pulp, in which the seeds of the arnotto-tree are inclosed, the Indians and Spaniards prepare a cool, agreeably rich cordial, which they mix with their chocolate, for improving its flavour, and heightening its colour. The roots possess nearly similar properties, but operate more powerfully by the urinary passages, they are employed by the natives in broths, and answer all the purposes of the pulp, though in a weaker degree.

ANSERES. In zoology, the third order of the Linnæan class *Aves:* thus ordinally characterised. Bill smooth, covered with a soft skin, and broader at the point, feet formed for swimming; toes palmate, connected by a membrane; shanks short, compressed; body fat, downy; flesh mostly tough; food, fishes, frogs, aquatic plants, worms, &c.; nest mostly on the ground; the mother takes but little care in providing for the young. There are eleven genera divided into those that have bills with, and bills without teeth. This order comprehends all kinds of water fowl.

ANT, or *Formica*, in zoology, is a genus of insects belonging to the sixth class of the animal kingdom. The characters of this insect are, that there is a small scale between the breast and belly; and the joint is so deep, that the animal appears as if it were almost cut through the body. The females and the neuters, or working ants, which have no sexual characteristics, are furnished with a secret sting; and both the males and females have wings, but the neuters have none. There are eighteen species, which are in general distinguished by their colours.

These insects cohabit in numerous parties, and maintain a sort of republic, no unlike that of the bees. Their nests are in the form of an oblong square, and contain paths which lead to different magazines. Their method of constructing these habitations is truly wonderful. Some of the ants are employed in making the ground firm by mixing it with a kind of glue, to prevent its crumbling, and falling upon them; others may be seen gathering several twigs, which they use for rafters, by placing them over the paths to support the covering: they lay others across, and upon these, rushes, weeds, and dried grass, which they form into a a double declivity, and thus conduct the water from their magazine.

For provisions they secure every thing which, to them, is eatable, and we may often observe one loaded with a dead fly, sometimes several together with the carcass of a may-bug, or other large insect; and, if they cannot transport it, they consume part of it upon the spot, at least so much as may reduce it to a bulk adequate to their strength. They lay up hoards of wheat and other corn: and, for fear it should sprout from the moisture of their subterraneous cells, they gnaw off the end which would produce the blade. It is remarkable, that if one ant meets another which is loaded, it always gives way, or will help it, if it be over burdened. Indeed, the strength of this little animal is astonishing, as one of them will frequently drag a burden many times heavier than itself!

On depriving a mouse or other little animal of its skin, and placing it on an ant-hill, in a little box, perforated in several parts, so as to admit a free passage for the ants, it will be found, in a few days, converted into the most perfect skeleton.

The ant deposits her eggs in the manner of the common flies, and from these eggs are hatched the *larvæ*, a sort of small maggots, or worms without legs; which, after a short time, change into large white *aurelia*, or chrysalids, usually called ant's eggs.

Although ants are considered as injurious to husbandry, by making their hills, and impairing the grass upon pasture land, yet they are unjustly reproached with damaging fruit-trees. In Switzerland, they are made subservient to the destruction of caterpillars, by hanging a pouch filled with ants upon a tree, whence they are suffered to make their escape, through an aperture, and over-run all its branches, without being able to reach the ground, as the trunk has been previously smeared with wet clay, or soft pitch, in consequence of which, impelled by hunger, they fall upon the caterpillars, and devour them.

Ants have also been successfully used in medicine. By distillation they afford an acid liquor.

We shall now proceed to state seve-

ral methods of destroying this numerous insect. The most simple of these is to pour boiling water into the apertures of their hillocks. By mixing soot with cold water, and pouring it at the roots of trees infested by them, they will speedily be destroyed. Besides that already mentioned, there is another simple expedient to prevent them from descending a tree which they visit. Nothing farther is required than to mark with a piece of common chalk a circle round its trunk, about two feet from the ground, and about an inch or two in breadth: as soon as the ants arrive at this ring, not one will attempt to cross it. This curious experiment, however, should be performed in dry weather, and the ring must be renewed, when partly washed off by rain.

The small garden-ants, which are supposed to devour the young shoots of fruit-trees, may be destroyed by placing among them a number of large ants, which are commonly found in the woods; as there prevails between these two species of insects so strong an antipathy, that the larger sort attack the smaller, and never relinquish the combat till they have extirpated, or driven their antagonists from the neighbourhood.

Mr. CLUTTERBUCK, jun. of Watford, washed the walls of his hot-house with a painter's brush, dipped in a solution made of four ounces of sublimate, in two gallons of water; and since that application, neither the red spider, against which this remedy was employed, nor ants, have made their appearance.

One of the most effectual methods of dispersing these troublesome insects from plantations and gardens, we believe, is that mentioned in the *Encyclopædia Britannica;* on the authority of which we shall communicate it to our readers: "A small quantity of human fæces, when placed in their hills, will not only destroy great numbers, but expel the rest from their habitations."

A new method of exterminating these insects, is recommended by Mr. FORSYTH; with a view to prevent them traversing walls, and injuring fruit. He directs a hole to be drilled in the ground, with a sharp pointed wooden stake, close to the side of the wall, and at such depth as the soil will permit. In consequence of the earth being stirred, the insects will be induced to move about: the sides of the hole are then to be made smooth, so that the ants, on approaching the edge of the orifice, may fall in, and be unable to climb upwards. When a considerable number is collected at the bottom, water may be poured on them, and thus thousands may be drowned. Great numbers may likewise be killed by strewing a mixture of quick lime and soot, along such places as are much frequented by ants: they may further be banished from trees by scattering a little pulverised STAVES-ACRE on the ground, around their stems; but, where it is practicable, it is best to open the nest of these insects, and throw in them a piece of quick lime with a sufficient quantity of water for slacking it, when the heat, together with the suffocating air thus evolved, will certainly destroy them

ANTHER, the upper portion of the stamen or male part of a flower

ANT-HILLS are so well known, that they require no additional description to that given under the article ANT. They are very injurious to dry pastures, not only by wasting the extent of soil which they cover, but by impeding the scythe at the time of mowing, and yielding a poor food pernicious to cattle. The manner of reducing them simply consists in cutting them into four parts from the top, and then digging deep enough to take out the core below, so that when the turf is replaced, it may be somewhat lower than the level of the rest of the land: thus the place will be more wet, and the ants prevented from returning to their former situation. The earth taken out should be scattered, or removed to a considerable distance, lest they might collect it, and soon form another hill. This useful kind of work ought to be performed in winter; for if, at that season, the places be left open, the frost and succeeding rains will destroy those ants which are in the lower part of their habitation. In Hertfordshire and Somersetshire, a particular kind of spade is used for this purpose; its blade is very sharp, and so formed that the whole edge describes about three-fourths of a circle.

St. Anthony's fire. See ERYSIPELAS, or ROSE

ANTHRAX, or *Carbuncle.* A large inflamed painful tumour; it commonly seizes the backs of old people Several cases of this complaint have occurred in Philadelphia within a few years past. I have seen a dreadful case in which the muscles of the back were as completely laid bare, as if dissected by a surgeon's hand. It was cured by the late eminent Dr. J. JONES of this city.

by emollient poultices frequently renewed, bark, wine, and generous diet *duly regulated*, and opium: and by removing the mortified edges when their separation from the living parts did not go on fast enough, or when the edges of the sore were left with large flabby irregular lips, which gave room for matter to lodge and prevented a reunion. The discharge of matter was very great, to prevent the smell of which a large cloth dipped in brandy was put over the dressings, and frequently renewed.

As a violent inflammation is always the first symptom, might not the application of twenty or thirty leeches to the part, prevent the progress of the disease? They might be renewed if necessary.

Anthoxanthum odoratum, L. See SWEET SCENTED SPRING GRASS.

Anthyllis vulneraria, L. See KIDNEY-VETCH

ANTIDOTES, are medicines which prevent or cure the effects of deleterious substances, either taken into the stomach, or externally applied to the human body.

Of those poisons which generally prove mortal when swallowed, the principal are arsenic, corrosive sublimate, glass of antimony, verdigris, and lead. Mineral poisons apparently attack the solid parts of the stomach; and, by eroding its substance, occasion death. Antimonials rather injure the nerves, and destroy by producing convulsions. Most vegetable poisons seem to operate in this manner; but fatal accidents more frequently happen from the former.

In the year 1777, M. NAVIER advised a drachm of the liver of sulphur, in a pint of warm water; but when this cannot be procured, the patient may substitute a gently alkaline lixivium, or soap-water, with sulphur. The cure may be completed by the constant use of milk and warm sulphureous waters. See ARSENIC.

The remedies most suited to obviate the effects of corrosive sublimate, are different preparations of the liver of sulphur, which decomposes or resolves the mercurial salt; and, by the addition of the alkali to the acid, forms an inoffensive neutral salt. Acids, therefore, even of the mildest kind, are fatal, if applied to counteract this poison, as they render it more active: thus, even lemonade, or treacle, are pernicious, as they contribute to increase pain and danger.

Volatile and fixed alkaline salts and spirits, also precipitate mercury, such as spirits of hartshorn, or sal ammoniac, salt of tartar, wormwood, &c. but, as these can seldom be obtained on an emergency, the following articles may be substituted, viz. pot-ashes dissolved in warm or cold water, but the lixivium should not be too strong. When pot-ashes are not at hand, warm water may be strained through ashes of bean-stalks, broom, straw, or any other vegetable that can be most readily burned. White or black soap should be injected by way of clyster, and likewise dissolved in all the water that is drank.

Those poisons which may be called *culinary*, are perhaps the most destructive; because they are generally the least suspected. No vessels, therefore, which contain *copper* in their composition, should be used in cookery, &c. In cases where the poison of verdigris has been recently swallowed, emetics should first be given, and afterwards cold water gently alkalised, ought to be drank in abundance.

Though *lead* may not be considered as a corrosive poison, its effects are nevertheless deleterious, and may be corrected by the remedies already suggested, namely, by drinking large quantities of acidulated liquors, or solutions of the liver of sulphur, and completing the cure by gentle laxatives; but, in the commencement of the complaint, drastic purgatives should be carefully avoided.

To obviate the ill effects of *opium*, emetics should be given as speedily as possible. If the first symptoms only appear, which are the same as those of intoxication, the following emetic will be of service, viz. Simple spearmint water and oxymel of squills, of each one ounce, and half a scruple of ipecacuanha: frequent draughts of water-gruel should be given, to assist the operation. If the poison has been swallowed in a liquid state, which may be ascertained from the smell of the first discharge, four or five vomitings may be sufficient; but, if in a solid form, two or three more must be procured, by giving fresh doses. Should the symptoms continue violent, it will be necessary to increase the quantity of the medicines, in proportion to the urgency of the case, and the strength of the patient. The principal object to be kept in view, according to Dr. SEAMAN, of New-York, is, to produce such a degree of irritation, as may

counteract the narcotic effects of this deleterious drug. Hence it is very useful to stimulate the nostrils with spirits of hartshorn, and to apply friction with salt over the whole body. Dr. Mease has known copious bleeding save a person, who was labouring under the effects of a very large dose of laudanum.

Lemon juice, vinegar, and other acid substances, have long been considered as effectual antidotes against opium; but they do not afford sufficient security, although undoubtedly useful

We seriously advise all persons in this unfortunate situation, immediately to avail themselves of medical assistance, it would be needless, to expatiate farther on the subject.

With respect to those vegetable substances which sometimes, though rarely, require antidotes, we shall in this place mention the following: 1 Camphor; 2. *Arnica*, or German Leopard's bane; 3. *Cocculus Indicus*, or India berry; 4. Gamboge; 5 *Datura stramonium*, or Thorn-apple; 6. *Veratrum album* or White Hellebore; and 7. *Mezereum*, or Spurg Olive. Against the violent operation of these medicinal drugs, exhibit either vinegar, or the acid of lemons

There are, however, many other vegetable, animal, and mineral substances, sometimes taken by mistake, or administered from malignant motives, and the fatal effects of which may be obviated by a timely use of their respective antidotes. In order to conclude this article, within its due limits, we are obliged to refer the reader to the following heads, where he will find each subject discussed as it occurs in the order of the alphabet, viz *Balsamine Seeds*, *Cassava*, *Coloquintida*, *Water-Crowfoot*, *Wild Cucumber*, *Bearded Darnel*, *Euphorbium*, *Spanish Flies*, *Foxglove*, *Glass*, *Gypsum*, *Hellebore*, *Hemlock*, *Henbane*, *Lead*, *Leadwort*, *Lime*, *Lobsters*, *Putrid Meat*, *Metallic Pointed Substances*, *Muscles*, *Deadly Nightshade*, *Nux Vomica*, *Oysters*, *Meadow Saffron*, *Saltpetre*, *Scammony*, *Sowbread*, *Stavesacre*, *Wolf's-bane*, and *Poisons* in general

ANTIMONY, a metallic substance of a greyish white colour, considerable brilliancy, and strongly resembling tin, or silver. Its texture is laminated, and the lamina appear arranged one over another, and crossing in every direction: its surface often exhibits a kind of crystal, in the form of stars or fir-leaves. It is very brittle, and easily pulverised; melts, when heated just to redness, at about 810 degrees Fahrenheit; evaporates, if the heat be increased; communicates to the fingers a peculiar taste and smell when rubbed upon them. Its specific gravity varies from 6702 to 6·86. The substance to which this name has been commonly though erroneously applied, is a mineral, or ore of antimony, composed of a mixture of sulphur with that metal; and it is accordingly, in the language of modern chemistry, denominated a sulphuret of antimony.

It is found in Germany, France, and also in England. The impurities which are found in the foreign sorts, are of the infusible stony kind, and are extracted by melting the antimony in vessels, the bottoms of which are perforated with small holes, so that the lighter and drossy matter rises to the surface, while the more pure and ponderous sinks, and is received into conical moulds. This mineral, when analysed, is found to consist of a metal united with common sulphur.

It is found in nature in the metallic state; or mineralised, most generally with sulphur, called *Crude Antimony*.

a. *Native Antimony*, usually mixed with iron and arsenic. It contains so large a proportion of the latter, that by fusion with sulphur, the product resembles realgar, or red arsenic, found in a matrix of calcareous spar or limestone.

b *Muriate of Antimony*, more rarely occurs. White antimonial ore: combined with muriatic acid of a greyish white colour, found in oblong, rectangular four-sided laminæ.

c. *Sulphurised* or *Sulphuretted Antimony*. Its colour is blueish or steel grey, corresponding to that of the common antimony of the shops, which is indeed nothing else than this ore, separated from its impurities by means of fusion. It is of metallic lustre, and often variegated on the surface. It occurs in lumps, interspersed, or more or less crystallised In the mass its texture is either compact, granular or foliated; more commonly, however, divergingly striated, or fibrous; when crystallised, its form, if determinate, is that of compressed hexahedral prisms, with obtuse tetrahedral pyramids, which are either comparatively large, massy, and longitudinally grooved; or more frequently in lengthened needle-like, or capillary prisms diverging from different centres and variously decus-

sating each other. It is opaque, brittle, very easily scratched with a knife, sometimes so soft as to soil the fingers, gives a blackish powder, it is very easily fusible, giving out a white sulphurous smoke; on the dissipation of its sulphur by a more gentle heat it leaves grey vitrifiable oxyde, equivalent, according to Bergman, to about 74 per cent. of regulus. It is frequently found in limestone, indurated clay, and iron pyrites; but most commonly associated with different forms of quartz. The French regulus of antimony, according to the experience of Messrs. BINNY and RONALDSON, of Philadelphia, is 15 per cent. better for types than the English. Antimony being of very great use in medicine and the arts, particularly in the very important manufacture of types, which are now made in this country in every respect equal to those imported, it would be of consequence to discover a mine of antimony in the United States.

Antimonial Wine, is prepared by simply infusing either the *crocus* or *ant. vitratum*, in wine: from ten to fifty or sixty drops of which are usually prescribed as an alterative and diaphoretic. In large doses, it acts as a diuretic and cathartic; and three or four drachms prove, in general, violently emetic. For this last purpose, it has been frequently employed in madness and apoplexy.

It is, however, a very uncertain medicine, because the more acid the wine, the stronger will the tincture prove. Hence scarcely two preparations of antimonial wine, are of equal strength: ten drops from one shop will sometimes vomit more than a tea-spoonful from another shop. It ought to be given up, and tartar emetic in minute doses, substituted.

Dr. JAMES WALKER, late surgeon to the British navy, gives a remarkable account of the effects produced by a large quantity of antimonial wine. Having ordered some whey, in consequence of a cold, that wine, in a mistake, was used instead of Lisbon. Of this whey, he drank a full English pint, in which was contained not less than a gill and a half of antimonial wine; but, instead of producing the effects which might naturally be expected, it was attended with an unusual propensity to sleep, with a lassitude and numbness of the limbs. His two medical pupils, who had eaten the curd, were affected in a similar manner. He consequently asks, "Whether, if its emetic quality be destroyed by its combination with milk, and exchanged for that of a narcotic kind, some useful hints might not be drawn from this case, and introduced into medical practice?"

An improvement in the preparation of the antimonial powder, which is substituted in regular pharmacy, for Dr. JAMES's *Fever Powders*, has lately been proposed to the *Royal Society*, by Mr. CHENEVIX. He directs equal parts of phosphate of lime and pulverised algaroth to be dissolved in the smallest possible quantity of muriatic acid; some caustic ammonia must then be mixed with distilled water, and the muriatic solution dropped gradually into the mixture: the result of such combination will be a copious white precipitate, which, by washing and drying, is rendered fit for use. This medicine has already been administered by some eminent practitioners; and according to the account of Mr. C. it possesses the valuable properties of the antimonial powder, though in a less concentrated form, so that the former may be exhibited in doses of less than eight grains, without exciting vomiting.

ANTIPATHY, in physiology, is used to express the natural aversion which an animated or sensitive being feels at the real or ideal presence of any particular object. Such are the reciprocal hostilities subsisting between the toad and the weasel; between sheep and wolves, and the aversion of particular persons against cats, mice, spiders, &c.

This prepossession is sometimes so violent as to induce fainting, even upon beholding their natural enemies. Most animals likewise evince a remarkable antipathy to the sight of the blood of their own species.

To explore this subject, without prejudice, it will be necessary to exclude those antipathies which are not authenticated, such as those between the weasel and toad, which can be extinguished or resumed at pleasure; or those, the causes of which are evident, we shall then be inclined to admit but a very inconsiderable number.

The aversion which prevails between the sheep and the wolf, cannot certainly be called an *antipathy*, as its origin is obvious; the latter devours the former, and every animal naturally shuns pain, or destruction. From similar causes proceeds that dread which many persons feel of serpents and reptiles. During the period of infancy, pains are taken to impress the mind

with the frightful idea that these animals are of a venomous nature, and that their bite is mortal. Such apprehensions are aggravated by the relation of dismal tales, which often make a lasting impression. When others, at their approach, have exhibited symptoms of terror, we have been persuaded to avoid them; and hence it is not surprising that we should entertain an aversion for such objects. Our emotions at the sight of what we fear, being excited while we are unprepared, will be in proportion to the sensibility of our frame, and the irritability of our nerves.

A person, who formerly had no dislike to particular objects, by associating with those who are subject to such idle fears, often acquires an unfavourable bias against things which, prior to those contagious examples, he beheld with perfect indifference. Thus, many evince an aversion to eels, which however, arises chiefly from their resemblance to serpents.

There are other antipathies, which do not originate from the source of the imagination, but from some natural loathing, such as is often perceptible in children, for particular kinds of victuals, which, though not distasteful, yet, from a weakness of the digestive organs, are disgorged as soon as swallowed.

Antipathies, in general, owe their origin to objects which are conceived to be dangerous; to a terror of imaginary disasters, to a squeamish delicacy; and of a rooted dislike to things supposed to be detrimental Those of children are to be conquered by teaching them the means of defence and security, or the methods of avoiding the influence of noxious agents; and when age has strengthened the judgment by demonstrating to them the nature and properties of those natural bodies or phenomena, which they fear, they will thus gradually overcome their early prejudices and antipathies. See SYMPATHY.

ANTIPODES, in geography, a name given to those inhabitants of the globe that live diametrically opposite to each other. The antipodes lie under opposite meridians and opposite parallels; in the same degree of latitude, but of opposite denominations, one being north and the other south. They have nearly the same degree of heat and cold, and days and nights of equal length, but opposite seasons. It is noon to one, when it is midnight to the other; and the longest day with the one, is the shortest with the other. The terms upward and downward are merely relative, and signify nearer to, and farther from the centre of the earth, the common centre to which all heavy bodies gravitate: wherefore, our antipodes, or the people who, with respect to us, seem to walk with their heads downward, have not their feet upward, nor their heads downward, any more than ourselves; because they, like us, have their feet nearer to the centre of the earth, and their heads farther from it. We all tend toward the centre of the earth in a direction from head to foot.

ANTIQUITIES, is a term signifying those testimonies, or authentic records of the early ages, which are transmitted to posterity by tradition.

The study of antiquities forms a very extensive science, including an historical survey of the ancient edifices, magistrates, officers, habiliments, manners, customs, ceremonies, religious institutions, &c. of the various nations of the earth. It is equally useful and interesting to the lawyer, physician and divine.

Antiquarian science may be divided into sacred and profane, public and private, universal and particular.

The antiquities of Greece and Rome attract the curiosity of every scholar; and though including the history of the Jews, Egyptians, Persians, Phœnicians, Carthagenians, and in short, every celebrated nation, they, by no means, contain the whole of this branch of learning. For, if to the general be added a particular acquaintance with statues, *bas reliefs*, medals, paintings, and the venerable remains of ancient architecture, this aggregate information constitutes a very interesting and extensive science.

To acquire a knowledge of the works of sculpture, statuary, graving, painting, &c. which are called *antiques*, strict attention ought to be paid to the substance, on which the art has been practised. as wax, clay, wood, ivory stones, marble, bronze, and every kind of metal: because, on comparing this with the subject, it frequently serves to discriminate the true from the counterfeit specimens.

Mr. BURGESS, in his ingenious Essay "*On the study of Antiquities*," printed in 1783, justly, observes, that "this study, once far removed from all the arts of elegance, is now become an at-

tendant on the Muses, and a handmaid to History, Poetry, and Philosophy.

Antirrhinum. See SNAPDRAGON, FLUELLIN and TOADFLAX.

ANTISCORBUTICS, signify those applications and medicines which are found useful in the cure of the scurvy, such as pure air, gentle exercise, milk, vegetables, fruit, &c. See SCURVY.

ANTISEPTICS, a term applied to those substances which resist or check putrefaction.

Numerous trials have confirmed Sir John Pringle's opinion of the antiseptic properties of alkaline salts, though they appear to be inferior to some resinous substances, and other vegetables. Thus myrrh, in a watery menstruum, has been found twelve times more antiseptic than sea-salt. Two grains of camphor were a better preservative of flesh than sixty grains of common salt. An infusion of a few grains of powdered Virginian snake-root, exceeded in antiseptic property twelve times its weight of camomile flowers, and the Peruvian bark possesses nearly the same extraordinary quality. These balsamic vegetables are the more valuable, as they are usually free from acrimony, and may be taken in much greater quantity than either spirits, acids, resins, or even neutral salts.

To the class of antiseptics we may also add fermented liquors, acids, vinous spirits, and even those plants called ant-acids, which formerly were erroneously supposed to accelerate putrefaction, particularly the scurvy-grass and horse-radish. [But as bodies do not act in the same manner, within the body as out of it, antiseptics are useless as medicines. T. C.]

ANTISPASMODICS are those medicines, which are calculated to relieve persons afflicted with cramps, spasms, or convulsions: such are opium, Peruvian balsam, and the essential oils of different vegetables. The most speedy antispasmodic, with respect to its *immediate* effects, is, doubtless, the juice of the poppy.

Essential oils act principally on some particular part, rather than on the system in general; and are seldom attended with any soporific effects. But, beside these internal medicines, there are some which instantly remove spasmodic contractions by contact; for instance, cream, oil of almonds, and asses'-milk; white sulphur, sal ammoniac, nitre, &c. mitigate these painful complaints, by diminishing heat. Where, however, spasms originate from inanition, and a defect of vital heat, the best antispasmodics are valerian, musk, and castor; because these medicines tend to restore the animal spirits, and at the same time operate as corroborants.

ANTITHESIS, a figure of rhetoric, which consists in opposing thoughts to one another, to increase their force. The antithesis is a favourite ornament with young writers: it gives energy, and, like all other departures from the straight road, its reputation depends upon its success. The following is an example:

> Polite, as all her life in courts had been;
> Simple, as courts she never yet had seen.
>
> *Lyttleton.*

APE, in zoology, an animal of which we find more than fifty species; it is more remarkable on account of its peculiar instincts, bodily structure, and habits of life, than from either its dangerous or useful tendencies.

Apes were formerly considered as a degenerated cast of mankind, because some of them, such as the *troglodytes*, or the African woodman, and the *ou-rang-outang*, bear a great resemblance to the human form. These creatures, and especially the former species, are gregarious, inhabit the thickest forests, are from four to five feet in stature, very ferocious and strong, and do not hesitate to attack even men. Several of those audacious bipeds possess such a degree of muscular strength, that ten unarmed persons are inadequate to the task of reducing one of them to obedience.

On a close examination of their external shape, however, and particularly of the head, it clearly appears that their structure is essentially different from that of our species. From the natural constitution of their bodies, they are not only deficient in the organs of speech, but do not even display the sagacity of dogs. As an instance of their deficiency of judgment, we shall only mention, that, notwithstanding their excessive fondness of enjoying the warmth and light of a fire in the woods, made by the natives, who seldom take the trouble of extinguishing it, those whimsical imitators have not even the ingenuity of supplying it with fuel; and therefore afford no proof of their reasoning powers.

Nevertheless, they are justly entitled to the next place to man when we con-

sider some extraordinary qualifications with which they are preferably endowed. Of this nature is their uncommon talent of imitation, which to them, is so far from being advantageous, or conducive to their safety, that it is ingeniously employed for ensnaring them into captivity. Thus the Indians wash their faces in the presence of apes with water, for which they substitute a solution of glue, or gum arabic: on leaving the vessel with this seductive liquor, the animal, without suspicion, imitates the natives, and being neither sensible of the danger attending this experiment, nor the means of preventing the effect, its eyes are soon pasted up, and it is exposed to the mercy of its enemy.

Besides making good use of their teeth and nails, apes defend themselves with branches of trees, stones, and the like. Their maternal affection is so great, that they frequently smother the dearest of their offspring: and hence it has been proverbially applied to mothers who spoil their children, by excessive indulgence in the articles of food and drink.

Aphis See PLANT-LOUSE.

APHORISM, is a term used to denote either an unconnected maxim, or a short, pointed sentence, comprising much in a few words. It is at present chiefly used in medicine, and law, thus we say, the Aphorisms of BOERHAAVE, HIPPOCRATES, of the Civil Law, &c.

It would be highly conducive to the progress of learning, if all elementary works, which treat of any particular art or science, were written in an aphoristic form, so that every detached fact, or assertion, might be reduced to a distinct proposition.

Apium graveolens, L. See SMALLAGE.

APOPLEXY is a disease in which the patient is suddenly deprived of sensation, and incapable of voluntary motion. It is usually divided into two kinds, the *sanguineous* and the *serous*. The symptoms which distinguish the former are, a sound sleep, preceded by giddiness, and attended with snorting, noise in the ears, corruscations before the eyes, and redness of the face. If any thing be put into the mouth, it is immediately returned through the nose; nor can it be swallowed unless the nostrils be closed, in which case there is danger of suffocation If the patient appear insensible, there is but little hope of his recovery Sometimes the consequence of this attack is hemiphlegia, or palsy of one side of the whole frame, which is evident from a distortion of the mouth towards the sound side, a contraction of the tongue, and stammering of speech

The general cause of sanguineous apoplexy, is a plethoric habit, with a peculiar determination of blood towards the head, and gout Whatever tends to accelerate the circulation, such as surfeits, intoxication, immoderate exercise, and violent passions of the mind, may sooner or later occasion this disease It seldom, however, occurs till persons have passed the age of sixty, and after a fulness of the veins has for a long time prevailed in the system. In many instances, it proves fatal on the first attack; and few survive a repetition of the fit. Those who apparently recover, are frequently carried off, without being warned of its approach.

The usual method of treatment consists in placing the body in an erect posture, and supporting the head in that situation; in copious and repeated bleedings from the jugular veins and temporal arteries, cupping, and the application of blisters to the head, or between the shoulders

In the serous, or watery apoplexy, the pulse is small and feeble, the complexion pale, and there is a diminution of natural heat Upon dissection, the ventricles of the brain have been found to contain a larger quantity of fluid than they ought in a natural state. This species is equally fatal as the other, and may arise from any cause which induces a debilitated state, such as mental depression, excessive study, long watching, &c In this alarming complaint, bleeding cannot be attempted with safety: acrid, stimulating purgatives, and emetics, have been employed with a view to carry off the superabundant serum; but, in debilitated habits, they are liable to strong objections. Volatile salts, cephalic elixirs, and cordials, are usually prescribed, which, if a hemiphlegia supervene, may be aided by cathartics, and sudorifics, gentle exercise, especially in a carriage; blisters, and such other stimulating medicines, as are proper in paralytic affections

The distinction of this disease in sanguineous and serous, is now usually given up, and the general state of the system attended to, in forming our indications of cure. In nineteen cases out of twenty, the disease is attended with a *full, strong,* and *slow pulse;* and requires *copious bleeding* for a cure

The sooner bleeding is performed after the attack, the better. The quantity of blood to be taken away, must be in proportion to the violence of the symptoms: but, in strong vigorous persons, accustomed to full living, from two to four pints may be safely drawn in the course of the first twenty-four hours, at two or more bleedings. Powerful purges of jalap and calomel (15 of the former, and 10 of the latter,) ought also to be given, and purging clysters frequently administered. The head must be shaved and cold water applied to it by means of cloths. Cupping the head and back of the neck, is also proper to relieve the vessels, and may be useful, when general bleeding is deemed improper, owing to the pulse sinking: when leeches can be had they may be substituted. A blister applied over the whole surface of the head is often of great service; it must be kept on twenty-four hours, and prevented from healing, by mixing some cantharides with the ointment used to dress the blister. All tight ligatures must be removed from about his body, and the head well raised. The air of the room should be frequently renewed, and no persons admitted but those necessary to administer to the sick. To prevent a return of this disease, it will be highly necessary to guard against too much fulness in the system, by proportioning the quality and quantity of diet to the exercise taken; to avoid intense application of the mind to any one subject, great fatigue of body, violent anger, indigestible food, especially at night, and wet feet. As the disease seldom comes on without some premonitory symptoms, attention ought to be paid to them, and the proper remedies administered in time These symptoms are a giddiness, dimness of sight, head-ach, faltering of the tongue, or drowsiness When any of these appear, some blood should be taken away, a purge given and low diet enjoined until the danger be over No usual evacuation ought to be suppressed, without supplying its place by means of an issue in the arm. [Apoplexy is very often gout. T. C.]

APOSTROPHE, in rhetoric, a figure, whereby the orator, in an extraordinary commotion, turns his discourse from the audience, and directs it to some other person, present or absent, living or dead, or to inanimate nature Thus Cicero in his oration for Milo, addresses himself to the great patriots who had shed their blood for the public; and calls them to the defence of his client. So the same orator, in his first Catilinarian oration, directs himself to Jupiter, the protector of the city and empire, and beseeches him to repel the parricide, &c.

APOTHEOSIS, in antiquity, an heathen ceremony, whereby their emperors and great men were placed among the gods It was one of the doctrines of Pythagoras, which he had borrowed from the Chaldees, that virtuous persons, after their death, were raised into the order of the gods And hence the ancients deified all the inventors of things useful to mankind, and who had done any important service to the commonwealth.

APPETITE, in general, signifies the natural instinctive desire, by which the animal is led to pursue the gratifications of sense. In the present instance, however, we shall confine its meaning to the craving for food In this respect, the appetite of man may be divided into three different species, though that evinced by inferior animals is naturally simple, because it is not impaired by art. Thus, if children were never enticed by weak parents, and ignorant nurses, to eat more than their own inclination directs them, or to partake of highly flavoured artificial dishes which stimulate the palate, and preternaturally distend the stomach, there is every reason to believe that the following classification would be unnecessary.

1. The *natural* appetite, which is contented, as well with the most simple as the most compound and delicious dishes: such is that of country people employed in hard manual labour: of children who have not been mismanaged in the nursery; and of every rational person who is convinced of the advantages resulting to both mind and body, from a simple and a frugal diet.

2. The *artificial* appetite of the epicure; the hypochondriac, and the tipler; all may be ranked under the same class. It would be needless to add in this place, any other remark, than that such an inclination for sensual enjoyment remains only so long as the operation of these exquisite stimulants continues. When the papillary nerves of the palate can be no longer influenced by such excitement, the sensualist loses his appetite, and is punished with all the concomitant symptoms of indigestion

3. The *habitual* appetite, though

partly acquired, is not liable to those serious objections which apply to the latter species: nor is it attended with any other disadvantages than those arising from long fasting, or an undue allowance of food on particular occasions. Thus after fatiguing exercise, when the fibres of the digestive organs are already weakened, and the circulation of the blood to those parts is unusually increased, the nourishment then received can be digested only with great difficulty, and to the detriment of the body.

Want of appetite may proceed either from a defective energy of the stomach, originating more frequently from an immoderate quantity, than the improper quality of food; or it may be occasioned by the sympathy of other diseased parts, such as the liver, bowels, uterus, &c. or by intestinal worms, obstructions of the mesentery, and many other causes. Hence it will be understood, that there can be no *specific* remedy suggested to remove the complaint; but that the treatment must be regulated by the nature of the case, and the constitution of the patient. In general, however, the following hints deserve attention. When the stomach loathes wholesome food, and is troubled with habitual flatulency, and eructations, of a bitter, rancid, or saline taste, an emetic is proper and necessary, to evacuate its foul contents Change of air and diet; early rising in the morning; gentle exercise; abstinence from all hot drinks, particularly punch; fat or hard meat; spirituous liquors, tobacco, &c.; and to avoid as much as possible the influence of depressing passions If there appear to be great fulness of the stomach, or bowels, attended with the symptoms before described, it will sometimes be necessary to give such an emetic as may, according to circumstances, at the same time relieve the bowels. A mixture of two parts of ipecacuanha wine, and one part of antimonial wine taken in single teaspoonfuls every quarter of an hour, without any farther drink till it begins to operate, generally produces the desired effect.

After the stomach and bowels have, by such, or similar means, been evacuated, it will be useful to strengthen the tone of the fibres, by drinking small draughts of cold camomile-tea, or an infusion of quassia, or simple toast and water well prepared, which last may be justly considered as one of the mildest and most grateful corroborants.

An *insatiable appetite*, (Boulimia,) may arise from too great a distension of the stomach in early infancy; from an over-abundant secretion of the gastric or digestive liquor; from drinking large quantities of stimulating, acid beverage, such as cyder, perry, butter-milk, &c but especially from a bad habit of fast eating, without properly masticating hard substances. Hence the first maxim in diet should be, *to eat slowly*, in order to prevent a sudden distension of the digestive organs, and to allow sufficient time for the food to be duly prepared, and gradually mixed with the gastric juice. It would be superfluous to add any other suggestions, respecting the treatment and cure of this troublesome complaint, which in the present times of frugality, cannot fail to find its own remedy.

The appetite for certain whimsical dishes, peculiar to females in particular states of the body, belongs to the articles, GREEN-SICKNESS and PREGNANCY.

[The pain of hunger may be greatly relieved, even for some days of total fasting, by small repeated doses of opium T. C]

APPLE-TREE, the common, or *Pyrus malus*, L is too well known in this country, to require a minute description. It frequently grows to the height of twenty or thirty feet, and produces a considerable variety of fruit. Botanists are of opinion, that the wilding, or crab-apple of the woods and hedges, is the original kind, from the seeds of which the apple now cultivated was first obtained

The varieties of this species are multiplied to some hundreds, in different places, all having been first accidentally procured from the seed or kernels of the fruit, and then increased by grafting upon crabs, or any kind of apple-stocks. Notwithstanding the numerous sorts, not above forty, or fifty are reared in the nursery. Their fruit arrives at full growth in successive order, from July to the end of October, but comes to maturity only after gathering; and several of the winter kinds may be preserved for many months.

Apples serve as excellent fruit for the dessert, the kitchen, and for making cyder. The following, which are in England most esteemed for eating, are ranged according to the successive order in which they ripen: the white juncating, margaret apple, summer pearmain, summer queening, embroi

dered apple, golden rennet, summer white calville, summer red calville, silver pippen, aromatic pippen, *la reinette grise*, *la haute bonte*, royal russeting, Wheeler's russet, Sharp's russet, the spine apple, golden pippin, nonpareil, and *pomme d'api*. Those for culinary use, are, the codling, summer marygold, summer red pearmain, Holland pippen, Kentish pippen, *courpendu*, Loan's pearmain, the French rennet, French pippen, royal russet, monstrous rennet, winter pearmain, *pomme violette*, Spencer's pippen, the stone pippen, and oaken pippen. Those most esteemed for making cyder, are, the Devonshire royal wilding, red-streak apple, white-sour, Herefordshire under-leaf, John-apple, or *deux ames*, everlasting hanger, and gennet moyle.

Among all the fruit growing in this country, says a celebrated botanical writer, apples justly deserve the preference. In raising these useful trees for orchards, or fields, whether for cyder, or baking, the wild crab kernels are the most suitable, as they yield hardy [illegible] which are better able to endure cold and coarse lands, take firmer root and produce larger trees. Where these seeds cannot be conveniently procured, the kernels of common apples may be substituted, especially with a view of ingrafting them. Although the former do not bring forth trees bearing the same kind of apples, yet they thrive without grafting, and their hard fruit may, notwithstanding its astringent and acid properties, be advantageously converted into cyder.

Culture. The method of propagating the cyder-fruit trees in Herefordshire, is by grafting. Very large, and even old trees may be grafted, so as to bear fine heads of other sorts, and thus they will produce a crop of fruit quicker than by any other method. New orchards are raised by planting well-grown crab-stocks, and grafting them the year after.

If the trees are full sized, the tops of them must be cut off in winter, otherwise, when grafted, they will, as it is termed, *bleed* so much, that the grafts will not succeed. The trees should not be cut down to the trunk, but as many branches must be left as look kind above, where it branches out about the thickness of one's arm; the tops of these must be taken off, about two or three feet above the part where they project from the trunk. Good crab-stocks, for raising new orchards, generally cost from 1*s* 6*d*. to 4*s*. each, according to their quality.

LINNÆUS considers the apple and the quince as species of the pear-tree, or *Pyrus*, all the varieties of which are hardy, and will succeed in any common garden soil, if planted in a free situation. They are propagated by grafting and budding upon any kind of pear-stocks, occasionally upon quince, and sometimes upon white thorn stocks.

Apples of every kind may be reared in the manner above-described; and, according to Dr. ANDERSON, the pure paradise-stock is the best graft. They will not thrive, however, in a low and moist soil, where they are apt to canker, and speedily decay. In a friable loam, they generally prosper extremely well.

Pruning. If a tree be very old, and much incumbered, the stumps, with all the decayed, rotten, and blighted branches, should be carefully removed: but instead of delaying this operation till the trees become too old, it ought to be commenced even in the nursery, and regularly continued; as, by the use of medications, the wounds will heal, without causing any blemishes.

When the trees are so luxuriant, as not to bear those prolific spurs, from which the fruit proceeds, the too abundant flow of their juices must be checked by the following method: the tops of most of the shoots are to be pruned off in August, the bark perpendicularly slitted in different places, and the trunk cut about one-third through with a saw, but so as not to injure the heart. For the first year or two, after this experiment, the tree will not bear more fruit than usual, but afterwards its production will be adequate to every expectation.

From this operation, a still further benefit may be derived. When there is a superabundance of moisture, the trees are liable to be covered with moss, which affords shelter for caterpillars and other insects; but this process in a great measure cures it, especially if the moss be carefully scraped off, or rubbed with a coarse, wet cloth.

The pruning of the tops diverts the channel of circulation, and accelerates the growth of the fruit-bearing shoots; while the cutting of the trunk, across, moderates the great rise of nourishment, or sap Thus the sawed part will overgrow in so complete a manner, that it cannot be discerned, except from the freshness of its bark.

Apple Blossoms are, in some seasons, injured by the devastations of an un-

common number of insects, produced from a species of black flies which deposit their eggs in the bud at its first opening; and which, by feeding on the heart of the bud, soon occasion it to contract and drop. To remedy this fatal effect, Mr. C. GULLETT advises to collect heaps of long dung, wet straw, weeds, &c. to dispose them in different parts of the orchard; and set fire to the heaps in that quarter from which the wind blows, so that the smoke may thoroughly fumigate all the trees. Thus the insects, which are supposed to be brought by the wind, will be prevented from depositing their eggs.

As very serious apprehensions were lately entertained in the cyder counties, that the moss growing on apple trees, and the millions of insects which harbour in it, might be destructive to orchards, we shall here insert another remedy discovered by Mr. TENCH of the Minories: "Take a quantity of unslacked lime, mix it with as soft water as your situation will furnish, to the consistency of very thick white-wash; this mixture, with a soft paint brush, apply to your apple trees, as soon as you judge the sap begins to rise, and wash the stem and large boughs well with it, observing to have it done in dry weather, that it may adhere and withstand rain: you will find, that in the course of the ensuing summer, it will remove all the moss and insects, and give to the bark a fresh and green appearance, and that the tree will shoot much new and strong wood; at least, it did so in Nova Scotia. The trial is simple, and can neither be attended with much expense, trouble, or danger."

In justice to Mr. FORSYTH, his Majesty's gardener at Kensington, we cannot omit to mention his composition used for the same purpose, and perhaps, of superior efficacy, if the nature of its ingredients be considered: To one hundred gallons of human urine, and one bushel of lime, add cow dung sufficient to bring it to the consistence of paint. After having carefully brushed off all the moss, the infected trees should be anointed with this mixture, about the latter end of March; which simple precaution, it is said, fully answers the desired effect.

Concerning the *physical properties* of apples, it deserves to be stated, that beside their aromatic qualities, they are wholesome and laxative, when fully ripe. In diseases of the breast, such as catarrhs, coughs, asthmas, consumption, &c. they are of considerable service: for these beneficial purposes, however, they ought not to be eaten raw, but either roasted, stewed, or boiled: they also may be usefully employed in decoctions, which, if drank plentifully, tend to abate febrile heat, as well as to relieve painful strictures, in pectoral complaints.

With regard to their sensible properties, apples have been divided into spicy, acidulated, and watery. To the first class belong the various species of rennet, which possess a most delicate flavour, contain the least proportion of water, and, on account of their vinous nature, are not apt to excite flatulency. Pippens, on the contrary, though affording more nutriment than the former, are more fibrous, and consequently require a more vigorous stomach to digest them: hence they may be ranked under the second class. Lastly, those sweet and tender apples which are very juicy and palatable, are the least fit to be eaten in a raw state, unless with the addition of bread or biscuit: when baked, or dried in the open air, they make an excellent substitute for raisins or plums, in puddings, pies, and other dishes prepared of flour.

Sour apples may be much improved, both in taste and quality, by either baking, or digesting them in a close vessel by steam, over a very slow fire: thus the saccharine principle is disengaged, and they undergo a speedy and complete change.

As apples are very liable to decay, especially in hard winters, various methods of preserving them have been tried, with different degrees of success.

One of the best expedients to preserve them for winter use, is, to let them remain upon the trees till there be danger of frost; to gather them in dry weather, and lay them in large heaps to sweat for a month or six weeks. At the end of that time, they should be carefully examined, those which have the least appearance of decay removed from the others, the sound fruit wiped dry, and packed in large dry jars, and then closely stopped, in order to exclude the access of air. If this plan be properly followed, the fruit will keep sound for a long time: it is, however, frequently impossible to procure a sufficient number of jars for this purpose; hence, in considerable quantities, the following methods are generally adopted:

In North America, as well as in Ger-

many, apples are often preserved during the most severe frosts, by placing them in an apartment immediately under the roof of the house, but without a fire; a woollen cloth being thrown over them before the frost commences. This experiment, however, has not succeeded in Britain.

In some parts, a coarse linen cloth is spread upon the floor of an upper room, and a layer of apples is placed on it; this is covered with a cloth of a similar texture, on which another layer is spread, and again covered: in this manner the pile may be increased to any height, with alternate strata of linen and fruit; after which a cloth, of sufficient dimensions to communicate with the floor on every side, is thrown over the whole heap. This practice has been attended with success.

Another method is, to put a layer of apples, and a layer of dried fern, alternately in a basket, or box (the latter is considered the best, as it admits less air), and cover them closely. The advantages of *fern*, in preference to straw, is, that it does not impart a musty taste. [But the best substance is the paper-cuttings of the book-binder.—T. C.]

This useful fruit may likewise be occasionally preserved from frost, by placing one or two tubs, or pails of water, in the room where apples are stored, taking care daily to break the ice, and, if thick, to renew the water, which, having a much stronger attraction for cold, protects the apples.

Gathering. This fruit should be gathered with the *hand*, and carefully placed in baskets; rejecting those which spontaneously fall, as unfit for long keeping. Moving the apples, in order to examine them whether sound, is likewise injurious to their preservation.

Apples abound in Pennsylvania, and in every state in the union, except in the maritime districts of the Carolinas and Georgia, which are sandy and level, and the air replete with humidity. In Pennsylvania we have a very great variety of apples, many of which are equal, in size, beauty and flavour, to any found in the world. Some begin to ripen in June, after harvest, and others ripen in succession until frost. A particular account will be given of the American apples when we come to the article "FRUIT TREES."

A very interesting paper by W DENNING, Esq. on the subject of the alarming decay of apple trees is inserted in the 1st vol. of the *Transactions of the New York Agricultural Society:* from which it appears, that on cutting down some apple trees which were far decayed, he discovered two worm holes running perpendicularly from the tap root through the heart; these holes were large enough to admit a pipe stem, and reached about fourteen inches above the surface, and from each hole a worm was taken. In some trees eight or ten holes were found. They resembled the peach tree worm. Mr D proposes no remedy, but as it is probable that the worm first penetrates the tree from without, and then takes a perpendicular direction, the only way to save the tree will be: either to destroy the egg when deposited on the bark by the fly, by frequently washing the trunk during the summer with warm urine, or warm soap suds; or to take out the worm at an early period. When the worm has entered the tree, it may be discovered by uncovering the root, and searching for the spot where the gum exudes: this will be found to be the entrance of the worm; to discover which a knitting needle must be used to perforate the hole. If the cavity be horizontal, the worm may be easily bored out, but if the direction of the wound be round the root, the whole course of the worm must be laid open with a small pointed knife until it be discovered. The wound must be then filled up with melted wax and oil, or FORSYTH's composition.

Several species of cerambyx or goat beetle, likewise prove very destructive to apple trees. They attack the trees about the surface of the earth. The female when in the perfect or beetle state lays her egg on the bark where it is hatched; and gradually gnawing, the insect works itself inwards: as it increases in size and strength, it perforates the trunk, from side to side, in various directions, which renders it porous and hollow; the tree becomes sickly, the leaves small, of a yellowish green colour and blotched; the extremities of the branches decay, and soon after the whole tree dies as it stands: at other times it breaks off even with the surface of the earth. Young trees attacked in this manner seldom recover, and after the trunk arrives to the diameter of 12 inches, they seem to be able to resist the assaults for some years longer. The entrance of the insect may be discovered by a powder like saw dust issuing from the hole: this may be perforated, and the insect

taken out: the wound made in the tree must then be carefully filled up.

As insects have increased greatly since the birds have been thinned by the increased number of sportsmen, and as we know that insects are the favourite food of almost all kinds of birds, particularly of the smaller kind; (See BIRD), "let us," says the amiable WILLIAM BARTRAM, "recal those benefactors, and put them again in possession of their natural rights and privileges; let them, at least for a time, be protected by law."

Dr ANDERSON describes an insect of the coccus tribe, that lives upon apple trees, and throws out such a quantity of cotton-like matter, as sometimes to cover every twig of the young trees It communicates a corrosive ichor, that affects the tree, after the insect itself is recovered, like a gangrene; so that the tree becomes blotched, uneven in the bark, and full of deep holes that soon produce decay and death. When these insects are discovered, they should be rubbed off, and the limb covered with cow-dung and urine, by means of a paint brush

Dr MITCHILL, in the 1st vol. of the *Transactions of the Agricultural Society of New York*, describes a phalœna, or miller, which conceals itself during the day in holes, and spaces under the loose bark of apple trees, and may be easily found by searching. The male has wings, but the female appears to have none: they were seen as early as the 25th of March in the State of New York, crawling towards the extremities of the twigs to deposit their eggs Thus, as soon as the leaves unfold and sprout forth, the worm bursts from the egg The insect preys upon the leaves, blossoms, and fruit

The method of preventing the destruction caused by these millers, will be, to keep the female from ascending the tree: for this purpose the tree may be encircled by a streak of tar early in the spring, but probably a more certain remedy will be found in the following observations.

A writer under signature "VIATOR," who dates from Hartford county, August, 1792, and whose paper is preserved in CAREY's *American Museum*, says, "Canker-worms never destroy apple-trees which stand on a stiff clay, or in low ground, where water stands long in the spring The reason for this is obvious. The canker-worm about the tenth of June descends into the earth, there to lie till the next spring, when the miller (phalœna) rises and ascends the trees. This worm is not strong, nor furnished with the necessary instruments for digging into a hard stiff clay: of course it cannot bury itself in clay, and is fond of gravel. The writer, therefore, proposes to lay a covering of stiff clay, round trees which stand on sand, or other light earth. This covering or layer, may be thrown upon the top of the natural soil, which may be renewed to the depth of a few inches. If the clay be laid on in summer or autumn, after the descent of the worm, it may prevent the miller from rising in the spring; if when the worm is upon the tree, it may prevent its finding a lodging; but, as in the latter case, the worm might travel some distance beyond the limits of the layer, it might be better to form the layer round the tree after the descent of the worm in June."

Apple-trees have not succeeded so well, in the course of the last 8 or 10 years, as formerly. Besides the worm, the decay may be owing to the winters becoming more mild, which occasions an earlier circulation of the sap and thus disposes the fruit-buds to be destroyed by late frosts; formerly, when the winters were cold and long, the vegetation was retarded until the danger of frost was passed. Another reason may be, the neglect of pruning; for it is well known that this important operation is seldom performed upon our trees, and thence they are overgrown with old and decayed wood, and after bearing 30 or 40 years, they die, or cease to bear In this situation are most of the old orchards near Philadelphia. Those in the remote counties of the state, which have been recently planted, bear well, but in a few years they will be in the same situation with the former, unless attention be paid to them. Besides pruning, the moss should be rubbed off, and manure put round the roots every year or two. This manure may consist either of rotten stable dung, or the blood of all slaughtered animals, which is too commonly thrown away; or the black water from the manure heap, which is *shamefully* permitted to go to waste, though abounding with the very essence of the food of plants.

The following directions are abridged from Mr. FORSYTH's *Treatise on Fruit*

Choice In choosing apple-trees from the nursery, observe that they have strong, straight and clean stems.

In heading old, decayed apple-trees, cut at the forked branches, as near as can be to the upper side of the fork, in a sloping manner, and round off the edges. Begin at the lower branches, and proceed upwards, cutting from one to six joints or forks according to their strength. Cut away cankered parts: apply the composition to all the cut limbs, and finish with the ashes, and burnt bones. A tree thus prepared, will, in the course of three or four years, produce more and finer fruit than a maiden tree, that has been planted upwards of twenty years.

Never shorten the young branches except they are very thin, when it will be necessary to do so, to fill the trees with young wood; nor prune any of the young shoots the second year (that is the year after they are cut), as many of the eyes almost to the end of the shoot, will, if it be strong, become fruit buds next year; and so on every year.

In the month of May, in the first year after the trees have been so cut, it will be necessary to go over them, and rub off all superfluous young shoots, leaving from 3 to 6 eyes on each shoot, according to the size and strength of the branch cut. These shoots will bear from three to four years, by which time they will be pretty much exhausted, by the great quantity of fruit produced from them; they should then be cut down to two eyes, to produce new wood.

Mr. F. always leaves the branches of three different years on the trees, and thus keeps them in a constant bearing state, whereas, if left to nature, they would only produce a crop of fruit once in two or three years, as almost constantly happens in the United States. When the shoot has done bearing, cut it off, apply the composition immediately, and rub off the shoots where they are too numerous.

Pruning. The best time to prune apple-trees in the United States, is in the month of March. The small shoots that cross each other, should be cut off, leaving the strongest to fill up the tree, and make a handsome head. Grub up suckers from the roots. Pare away knobs where branches have been cut off, leaving the surface of the tree as smooth as possible; and apply the composition.

Apple trees which grow in low situations, or within fifty miles of the sea coast, and have not the soil tilled round them, are subject to be overgrown with moss, which in a few years, will cause the trees to become bark bound, and greatly diminish their growth and produce. To cure these defects, and prevent their return, Mr. M. OGDEN, of Flushing, Long-Island, keeps the ground of his orchard ploughed; and scrapes off the moss from the trunks and branches of the trees with a hoe or drawing knife, and then spreads over them a small quantity of new, strong, soft soap, by means of a long haired brush. The soap destroys the moss and softens the bark; and when washed off by rain, acts as a manure to the roots. When Mr. OGDEN began this process his trees were covered with moss, and old scaly bark, and bore bad crops; but, in two years, all the old bark dropped off, and the bodies became as smooth as a young poplar. The soaping may be done at any season, and repeated if necessary. When the tree is bark bound, it will be necessary to slit the bark in two or three places down the bodies, observing not to let the knife wound the wood of the tree; the best season for this work is early in the spring.

Apple-trees raised from the pumice, if transplanted in time, nipping off the end of the tap root, may be fit for grafting one or two seasons earlier, than if left in the place where sown. This observation is the result of the experiments of the *Agricultural Society* of Nova Scotia.

The following observations were communicated to the editor, by Mr. J. COOPER, of New Jersey, and will therefore command serious attention They refer in part to subjects already mentioned, but it was deemed best to insert them unconnected with the observations of others

"Experience for more than fifty years has convinced me, that although seedlings from apples will scarcely ever produce fruit in New Jersey, exactly similar to the original, yet many of them will produce excellent fruit: some will be even superior to the apples from which the seeds were taken. This fact has led me to plant seeds from the largest and best kind of fruit, and from trees of a strong and rapid growth; and to let all young trees bear fruit before grafting, which produced an uncommon strong shoot, or large rich looking leaf. I have seldom known them fail of bearing fruit having some good quality; at all events they make a stock to put any good kind on which may afterwards present itself.

"In grafting or budding apple-trees,

it is best to perform the operation within or near the earth, if of such kinds as produce an erect strong stem; but on such kinds as incline horizontally, or small weak shoots, the preferable mode is, to insert the bud or graft high enough to form a top.

"I have in numerous instances seen the stock have great influence on the fruit grafted thereon, in respect to bearing, size, and flavour; and, also, on the durability of the tree, particularly in the instance of a number of vandevere apple trees, the fruit of which was so subject to the bitter rot as to be of little use. They were ingrafted fifty years ago, and ever since, those of them having tops composed of several different kinds, though they continue to be more productive of fruit than any others in my orchard, yet are subject to the bitter rot, the original and well known affection of the fruit of the primitive stock. I have had frequent opportunities of observing the same circumstance, in consequence of receiving many scions from my friends, which after bearing I have ingrafted, and the succeeding fruit uniformly partook in some degree of the qualities of the former, even in their disposition to bear annually or biennially.

"Pruning is an affair requiring great care and judgment, as the future prosperity of the tree greatly depends thereon. In the first place young fruit trees should not have the side shoots cut close to the stem, as the whole growth is thereby forced to the top, which soon becomes so weighty as to bend and spoil the tree. I have found it better to cut the ends of the side shoots so as to keep the tree in a spiral form which will encourage the growth of the trunk, until it acquires strength to support a good top. The side shoots may then be trimmed close. In forming the top, I have found it necessary to lighten the east and north-east sides, as fruit trees generally incline that way; and to encourage the branches on the opposite quarters to keep the sun from the trunk, otherwise the rays of that luminary, when striking at nearly right angles, will kill the bark, bring on canker, and ruin the tree. The best method that I have found to heal such wounds is a composition of resin, tallow, and bees wax, of a proper consistence to stick, applied after taking off the dead bark; and if suckers shoot out below the wound, they ought to be trained so as to shade the affected part, until the branches above will answer the purpose. By these means I have recovered many trees which would have perished if neglected. I also endeavour to prevent acute angles in any part of the tree [illegible] growth takes in bark which is the general cause of the branches breaking off or splitting from the weight of fruit or from high winds."

APPRENTICESHIP, is the binding of a person by covenant, to serve his master for a limited period, on condition of being instructed in his trade or occupation. Its usual duration is for the term of seven of years in England, after which the apprentice himself is entitled to become a teacher, and to engage pupils to serve under him.

Apprenticeships were unknown to the ancients. The Roman law makes no mention of them; nor is there any Greek or Latin word which expresses the idea now annexed to this appellation.

APRICOT-TREE, the *Prunus Armeniaca*, L. is a species of the plum, or cherry-tree. Although LINNÆUS [illegible] reduced these different trees to one genus, which he calls *Prunus*, yet we shall in this place enumerate only the varieties known under the name of apricot:

1. The *male*, or *early* apricot, which produces a small, round, reddish fruit; has more stone than pulp, ripens in July, and has but an indifferent flavour. As this tree blossoms early in spring, it is liable to be injured by night-frosts, against which it ought to be protected, by placing contiguous to it shallow vessels filled with water.

2. The *white* apricot is oblong, flat at both ends, and of a pale colour: its tree is not only less influenced by cold, than any other sort, but also bears fruit in greater abundance.

3. The *orange* apricot acquires, when ripe, a deep yellow colour, is distinguished by a sweet kernel, but its fruit is more fit for preserving, drying, and using in pastry, than for the dessert.

4. The *red* apricot is of an oval size, its pulp likewise reddish and juicy, and the kernel sweet like a hazle-nut: the leaves of this tree are longer than those of any other variety.

5. The *large* or Turkey apricot, exceeds in size and beauty all the other sorts, has a deep yellow pulp and sweet kernel, but is not productive.

6. The *Breda* apricot, a native of Africa, is one of the finest and most

delicious: its fruit is large and round, externally of a deep yellow, and internally of a golden colour. Its kernel is the largest of the kind: and if this fruit arrive at m[illegible] in an airy situation, it deserves an unqualified prefe[illegible]e.

The *Brussels* apricot is of a middle size, somewhat oval; on its southern exposure [illegible], with many dark spots, and greenish or deep yellow on the opposite side. Its fruit is firm, and of a delicious taste; the skin is apt to burst before the fruit is mature, and it seldom ripens until August or September. Some amateurs even prefer it to the preceding species. Lastly:

8. The *peach* apricot is more spherical and larger than any other species; while it possesses the sweetness of the apricot combined with the acidulated vinous taste of the peach. This tree, however, requires a temperate climate, and will not thrive in the open air of this country.

Culture. All the varieties of apricot [illegible] have originally been raised from their stones: they were then propagated by budding or grafting on any plumb stock. The soil most congenial to their nature, is a rich black mould; for they will not prosper in a loamy, sandy, gravelly, damp, or cold ground. As they are generally placed near walls, an eastern aspect will be the most eligible and proper, because they are apt to grow mealy, from the strong and constant heat of the sun, in a southern direction. In a luxuriant bottom, they may be planted at a distance of sixteen or twenty feet from each other; but in an inferior soil, from twelve to fifteen. When transplanted in the month of October, no other branches ought to be pruned off, except such as cannot be fixed to the wall. After the tree has been properly set in the ground, its branches should be loosely tied, and the surface of the soil surrounding the stem covered with good manure, partly to prevent injury from frost, and to afford more nourishment to the roots. Towards the end of February, or beginning of March, the branches must be untied, and the top of the tree cut off, while the operator's foot should be placed close to its trunk, and only four or five eyes are to be left above the place where it has been grafted: taking care that the oblique side of the cut be turned towards the wall.

During a dry spring, the roots may be occasionally watered, and covered with a little straw or grass plats, in order to protect them against night-frosts, and afford them additional moisture in summer. All the young shoots should be trained horizontally. About the end of September, the branches are again to be loosened, and pruned, so that two only may remain, one of a larger size, from eight to nine, and an inferior one, from five to six inches long.

In the second summer, all the straight shoots ought to be removed, as in the first, while the new sprigs are transversely fastened close to the wall, so that the trunk of the tree remain free; the pruning, however, should not be attempted later than in the course of April. About the 28th of September, the young shoots are again to be dressed, as in the preceding year; and the most vigorous left from eight to ten, but the weaker ones, only six or seven inches long.

A similar treatment must be pursued in the third and following years. It deserves farther to be remarked, that apricots bear their buds and blossoms not only on the branches of the preceding year, but likewise on the young shoots and tops of these branches: hence the dressing of them, during summer, ought to be performed with additional care.

Uses. From the vinous and saccharine nature of this fruit we may readily conclude that it is possessed of antiseptic, cooling, and nutritive properties; yet, unless fully ripe, it is apt to ferment and turn acid and weak stomachs, especially of those persons who are subject to flatulency and eructations: hence apricots ought to be eaten in moderation, with the addition of a little bread, and rather before, than after meals. In short, they are more useful to bilious and plethoric, than to phlegmatic and hysterical individuals, or those troubled with hypochondriacal complaints.

In France and Germany, the orange apricot is usually preserved in a dry state, for the winter, when it forms a delicious ingredient in pies, tarts, &c.

The kernels of several species of apricots contain a sweet oil, on account of which they were formerly, like sweet almonds, used in emulsions, and considered as vulnerary and anodyne: at present, however, their use is confined to external applications, in which the expressed oil of these kernels has some-

times been of service, for a contracted and chapped skin of the hands and lips, sore nipples, painful ears, and similar cases.

Dr. WILLICH recommends an easterly aspect for apricot trees: but in the United States, an easterly, north, or north-easterly exposure is highly injurious to this fruit. Apricot trees should be screened by a high wall, fence, or building, from the winds of those quarters, otherwise the trees will not bear, though they may grow large.

The best time for planting apricots, according to FORSYTH, is in autumn, as soon as the leaf is observed to fall. Choose trees with the strongest and cleanest stems. The ground must be a light, fresh loam. When the trees are planted, they should, by no means, be headed down till they begin to throw out fresh roots. Strong trees should then be cut a foot from the ground, and those that are weak about half that length. In backward seasons, they should not be headed down until the buds are fairly broken; always observing to cut sloping towards the wall, and as near to an eye as possible, that the young leading shoot may cover the cut. The shoots then thrown out, must be trained horizontally, to cover the wall, or attached to a railing near the border. The number of shoots left out ought to be, from three to six on each side, according to the strength of the main shoot, taking care to rub off the fore right shoots all over the tree, except a few which may be wanted to fill up the wall near the body of it.

Apricots, and other stone fruits, thrive best in paved yards, or where the ground is permitted to remain undisturbed round the roots. They succeed no where better than in confined paved yards in our cities.

APRIL, the fourth month of the year, according to European computation. The word is derived from the Latin *aprilis*, of *aperio*, I open; because in this month the leaves and blossoms open; and the frost, by which the earth is closed, retires. In this month the sun passes through the sign *Taurus*, or the bull; or, to speak more exactly, he enters this sign on the 20th of April, and remains in it till about the 20th of May.

APTERA, in the Linnæan system, is the seventh order of insects, the distinguishing characteristic of which is, that the beings comprehended in it have no wings. This order includes all kinds of spiders, the lice of different animals, scorpions, crabs, &c.

AQUA FORTIS, the nitrous acid of a certain strength, and so called from its dissolving power; but, when in a concentrated and smoking state, it is denominated *spirit of nitre*. It is made by distilling three parts of purified nitre with two parts of oil of vitriol. See ACIDS.

As this powerful liquid is used for various purposes in the arts and manufactures, but chiefly by dyers, brass founders, hatters, &c. great caution should be observed in employing it, because it possesses a very caustic property, and its fumes are highly deleterious to the organs of respiration.

In casualties where a person has, by mistake, swallowed a portion of aqua fortis, the following treatment will be the most proper for averting the imminent danger of suffocation. Immediately after the accident, luke-warm water ought to be drank in the greatest possible quantity, even to the amount of several gallons, to weaken the causticity of the poison. Next, a mixture of half an ounce of magnesia, in one pint of water, should be taken in about six or eight small draughts; and as the effervescence thus occasioned in the stomach, greatly tends to weaken that organ, it will be necessary to make use of more water, and other diluent, or mucilaginous drinks.

If, however, the sensation of a burning pain in the stomach and bowels should not subside, after plentiful vomiting, large draughts of sweet cow's milk must be swallowed, with the addition of one drachm, or sixty drops of liquid tartar, usually called *oil of tartar*, to each pint. But previously to the expulsion of the poison by vomiting, or the neutralising of it with alkaline solutions, neither milk, oily, nor saponaceous draughts can be taken with advantage. Hence those ought to conclude the cure; during which the patient may frequently use gargarisms and clysters of the same liquids, which are directed to be taken internally. Indeed, after the poisonous fluid has left the stomach, and entered the intestinal canal, the principal benefit will be derived from emollient and balsamic injections.

AQUA REGIA, is a compound of the nitrous and marine, or muriatic acids, in different proportions, according to the purpose for which it is required; and usually made, by dissolving sal ammoniac, or common salt, in nitrous acid. When the former is employed, the usual proportion is one of this salt

to four of the acid; but equal parts will be necessary to dissolve *platina*.

Aqua regia is used as a menstruum for gold; it likewise dissolves all other metals, silver alone excepted. The best kind for the above-mentioned purpose, is a preparation of three parts of the pure marine, with one of the nitrous acid. One hundred grains of gold require for their solution, two hundred and forty-six of this mixture. Concerning the nature and cure of those casualties which may arise from an improvident use of this powerful solvent, we refer to the preceding article.

AQUATINTA, a style of engraving, or rather etching, by which an effect is produced similar to that of a drawing in Indian ink. For the performance of the mechanical part of this art, the principal thing necessary is the following powder: Take equal portions of asphaltum and fine transparent resin, suppose two ounces, and pound them separately Then, with a muslin sieve, the rim of which may be formed of part of a chip box of three or four inches diameter, alternately sift thin strata of asphaltum and resin upon paper, till the powders are exhausted: then pass the mixture through the same sieve upon paper once or twice, so as to render the incorporation complete, and it will be fit for use: or according to some, powdered gum sandarach alone will answer the purpose. The act of aquatinting is to be performed as follows: The outline being etched upon the plate in the usual manner, the ground is to be softened with a little grease, and then wiped clean with a soft rag, so as only to leave a dimness on the surface of the copper. The powder already described is now to be sifted upon the plate; and the latter, afterward, struck upon its edge, to the end that all the powder not detained by the grease may fall off. This done, the back of the plate is to be held with a hand-vice over a charcoal fire, or lamp, till it becomes so hot as to give pain if touched. The powder which adhered to the grease will now be fixed to the plate. The plate being suffered to cool, take turpentine varnish, mixed with ivory black, and with this, by means of a hair pencil, cover all the lights, or parts, where it is intended that the paper shall be left perfectly white. The aqua fortis is now to be used, as in common etching. Suffer it to remain on the plate five minutes for the lightest tint; after which pour it off, and set the plate on its edge to dry. Then, with the varnish stop out the light shades, and proceed in the same manner for the several tints that are required, adding the deepest last, when all the fainter are completed and covered. On the fineness of the powder depends that variation in the grain of the tint which is observed in different prints, or in different parts of the same. In Paris, aquatinted designs are printed in colours; for which purpose, several plates must be used, on each of which only the parts that are of the same colour are to be etched. [See 37 Philos. Magaz. p. 297. for the improvements of Mr. HASSEL of Clement's Inn —T. C.]

AQUÆDUCT, a conduit of water, is a construction of stone or timber, built on an uneven ground, to preserve the level of water, and convey it, by a canal, from one place to another. There are aquæducts under ground, and others raised above it supported by arches. The Romans were very magnificent in their aquæducts; they had some that extended 100 miles. Frontinus, a man of consular dignity, and who had the direction of the aquæducts under the emperor Nerva, tells us of nine that emptied themselves through 13,594 pipes, of an inch diameter. Vigenere has observed, that, in the space of 24 hours, Rome received from these aquæducts no less than 500,000 hogsheads of water. The three chief aquæducts now in being, are those of the Aqua Virginea, Aqua Felice, and Aqua Paulina.

Aquilegia. See COLUMBINE.

ARABLE LANDS, in general, are those naturally fit for tillage, or which may, by proper means, be prepared for the production of grain.

The just proportion between arable and pasture lands, has, in England, of late years, been much exceeded in favour of the latter. It is asserted by competent judges, that, though the prevailing rage for breeding cattle of the finest quality and to the greatest extent, has doubtless benefited the grazier, and the lord of the manor, yet this practice must certainly be attended with disadvantages to the community at large.

[The regular and natural distribution of all farms, where local circumstances do not afford reason for deviation, is, that the dung furnished by the pasture land cattle, and the turnip-fed cattle, shall be sufficient to manure one-fourth of the farm yearly. For no arable crops can succeed without manure: and the regular source of supply of ma-

nure is the straw of the grain crops impregnated with the dung of the pasture fed cattle.—T. C.]

ARBOR DIANÆ, or Silver Tree, is the result of an experiment in chemistry, by which the branches and figure of a tree are represented by an amalgam of silver and mercury, which appear to vegetate in a very beautiful manner Experiment. Take one part of silver, and with it saturate a certain portion of nitrous acid: this is to be diluted with twenty parts of clean water, and poured upon two parts of mercury. After a short time a crystallisation will take place, in the shape of a tree, with its branches, &c.

ARCH, a concave building with a mould bent in form of a curve, erected to support some structure. Arches are either circular, elliptical or straight, as they are improperly called by workmen. Elliptical arches consist of a semi-ellipsis, and have commonly a keystone and imposts, they are usually described by workmen on three centres. Straight arches are those used over doors and windows, and having plain straight edges, both upper and under, which are parallel, but both the ends and joints point towards a centre. The term arch is peculiarly used for the space between the two piers of a bridge, for the passage of water, vessels, &c.

ARCHBISHOP, the highest dignity in the English church. It is possessed by the two prelates of Canterbury and York. An archbishop consecrates the inferior diocesans, as those ordain priests and deacons. When invested with his dignity, he is said to be enthroned; a term which probably originated with that period of English history, in which the archbishop of Canterbury had some of the privileges of absolute royalty. At this day, the style and title of archbishop of Canterbury is as follows: "John, by divine providence, lord archbishop of Canterbury, primate of all England, and metropolitan:" and he is addressed, "your grace;" a form likewise observed toward the metropolitan of York, who is not, however, styled a primate, and whose jurisdiction, though similar in nature, is considerably less extensive. The archbishop of Canterbury is the first peer of England, and ranks next to the royal family, having precedence of all the great officers of the crown: he claims, by custom, the office of crowning the king and queen. The archbishop of York takes the same precedence of the nobility and officers of state, with the exception of the lord chancellor.

As the district over which a bishop presides is called a diocese, so that under an archbishop, which includes many dioceses, is denominated a province; and thus, in ecclesiastical matters, all England is divided into two provinces. Each archbishop, in his province, exercises authority over the bishops and inferior clergy; and has the power of probates of wills, and of granting letters of administration, as each particular bishop has within his own peculiar diocese: thus the probate of the will of a person who has resided within the diocese of London, may issue from the bishop of London, or from the archbishop of Canterbury, within whose province London is included. The archbishops have also power to grant licenses and dispensations in all cases formerly carried to the court of Rome; and accordingly issue special licenses to marry, to hold two livings, &c. They have likewise the several courts of ecclesiastical judicature; as court of arches, court of audience, prerogative court, and court of peculiars.

Archangel, Yellow. See WEASEL-SNOUT.

ARCHERY, is the art, or exercise, of shooting with a bow and arrow.

Among ancient nations, the bow was the principal instrument of war; and the skill of the archer often decided the fate of battles and of empires.

The English were particularly expert in the use of this instrument: and their ever memorable victories at the battles of Cressy and Poictiers, were chiefly ascribed to their valiant archers.

JAMES the First of Scotland, who had seen and admired the dexterity of English archers, and was himself a skilful bowman, endeavoured to revive that exercise among his own subjects, by whom it had been neglected; but the untimely death of that excellent prince, prevented the effectual execution of this useful project.

In the time of EDWARD the Third, there was an act of Parliament, which obliged the English archers, even in times of peace, to erect butts in every parish, and to shoot on Sundays and holidays. By this constant practice, the English armies possessed an exclusive advantage over their enemies

CHARLES the First of England, from a treatise entitled "The Bowman's

Glory," also appears to have been an archer. In the eighth year of his reign, he issued a commission to the Chancellor, Lord Mayor, and Privy Council, to prevent the fields near London from being so much enclosed, as "to interupt the necessary and profitable exercise of shooting."

The use of the long-bow continued in estimation for more than two centuries after the introduction of gunpowder; which was probably owing to the weight and unwieldiness of muskets.

The distance to which an arrow may be shot from a long-bow, depends, in a great degree, on the strength and size of the archer, but in general is reckoned from eleven to twelve score yards.

Archers consider an arrow of from twenty to twenty-four drachms weight, to be the best for flight, or hitting a mark at a considerable distance; and yew, the best material of which they can be made. The feathers of a goose are generally preferred; two out of three are commonly white, being taken from the gander; the third is brown or grey; and this difference of colour informs the archer when the arrow is properly placed. The long bow is of the same height as the archer himself: and in England a peculiar manner is practised by drawing the arrow to the ear, and not towards the breast; which is doubtless more advantageous than that adopted among other nations.

The force with which an arrow strikes an object at a moderate distance, may be conceived, from the account given by King EDWARD VI. in his Journal, where he says, that one hundred archers of his guard, discharged in his presence two arrows each; that they shot at an inch board, and many of them pierced it quite through, though the timber was well seasoned

It may perhaps be a subject worthy the consideration of government, whether the revival of archery by uniting military discipline with manly exercise, might not become an additional means, both of preserving health, and protecting us against foreign enemies. According to NEADE, an archer might shoot six arrows in the time of charging and discharging a musket; and an ounce of fire work may also be discharged upon an arrow, to the distance of 240 yards.

The earliest histories of archery in England, are those by ASCHAM, who wrote his *Toxophilus* in the reign of HENRY VIII; MARKHAM's *Art of Archery*, which appeared in 1634; and Wood's *Bowman's Glory*, in 1682: but the latest, and most complete work on the subject, is, "*An Essay on Archery*," describing the practice of that art, in all ages and nations; by W. M. MOSELEY, Esq. In this classical treatise, the author considers bows, arrows, quivers, butts, targets, and cross-bows, under different heads; and his account is illustrated by plates. Ease and perspicuity; richness without verbosity; and elegance untainted with affectation, are the characters of this entertaining work.

Archery continues to be practised by the inhabitants of Geneva, and in many parts of Flanders. In Britain there are several societies of archers, the principal of which are the Woodmen of Arden, the Toxopholite, and the *Royal Company of Archers of Scotland*.

ARCHITECTURE, a term which denotes the art of building in general, though chiefly applied to the construction of edifices appropriated to the purposes of civil life, such as houses, churches, halls, bridges, &c &c

The origin of this art is involved in obscurity. All regular buildings, however, hath, by several authors, been generally, and very plausibly deduced from the construction of the meanest huts. These were, at first, probably made of a conic figure, which is the simplest in structure, but being inconvenient on account of its inclined sides, both the figure and construction of the huts were changed, by giving them a cubical form.

At length mankind, insensibly improved in the art of building, and invented methods of rendering their habitations durable and handsome, as well as convenient They deprived the trunks of trees of their bark, and other inequalities of surface, raised them above the wet, or humid soil, by means of stones, and also covered each with a flat stone, or slate, to exclude the rain. The interstices between the ends of the joists, were closed with wax, clay, or similar substances: the position of the roof was likewise altered; and, as on account of its level surface, it was unfit to carry off the abundant rain-water, they elevated it in the middle, by placing rafters on the joists, to support the earth and other materials of the covering. From this simple construction, the orders of architecture

undoubtedly took their origin; for, when the rude builder began to erect stately edifices of stone, he imitated those parts which, from necessity, had composed the primitive huts. Thus, the upright trees, with stones at each end, were the origin of columns, bases, and capitals; and the beams, joists, rafters, &c which formed the covering, gave rise to architraves, frizes, triglyphs, cornices, &c.

Although the first buildings were rough and uncouth, because the artificers of those remote ages possessed neither skill, experience, nor tools, yet, when by length of practice, certain rules had been established, and many new instruments invented, the art rapidly advanced towards perfection: a variety of style, or different methods of building were discovered, which, by succeeding generations, have been held in the greatest esteem.

In the 12th century, architecture revived, and experienced very great improvements, in consequence of the religious zeal of the clergy; and, in the 15th and 16 centuries, the chaste style of the Greeks and Romans was displayed in Britain. For, though the Italians for a long time maintained their superiority, in this as well as in other arts, over all the European nations, yet as men of genius from distant parts constantly resorted to Italy for the purpose of improvement, since that period architects have arisen in Britain, equal to any that ever appeared on the classical ground of Italy.

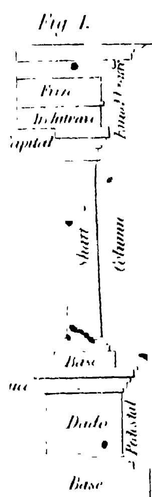
We speak of military architecture, as in the construction of fortifications, and of naval architecture, when we mean the building of ships; but, these exceptions apart, we always intend, by the term architecture, something very different from the mere art of building; and accordingly, an architect and a builder are persons of separate professions. Architecture is always an indulgence of taste: but taste has suggested to nations, unacquainted with each other, very dissimilar notions of beauty. There exist at present several styles of architecture, that appear to be radically distinct from each other. One style, though much varied, presents itself in India, Africa, and the ancient fabrics of Europe; but between the architecture of Hindostan and that of China no affinity is discoverable: and still less does that of Greece bear any comparison with the rest. Respecting the origin of this latter, which is that at present admired in Europe, history carries us no farther than to that period (itself remote) when Egypt was the seat of empire and of arts; and even there, the information is so obscure, that we can by no means decide upon the degree of excellence to which it was at that time carried, but are forced to allow to Greece a considerable share of the praise that we bestowed upon the art of which she undoubtedly learned the rudiments, at least, in Egypt. Rome, the next heir of civil glory, studiously copied the merits of her parent; and, from Rome, all Europe has in this, as in most other instances, received its lessons. To Greece we are indebted for the three principal orders of architecture, the Doric, the Ionic, and the Corinthian; Rome added two others, both formed out of the former, the Tuscan and the Composite. Each of these has a particular expression; so that a building, or different parts of a building may be rude, solid, neat, delicate, or gay, accordingly as the Tuscan, the Doric, the Ionic, the Corinthian, or the Composite are employed. The columns of these several orders are easily distinguishable to common observers, by reason of the ornaments that are peculiar to their capitals, but the scientific difference consists in their proportions. We shall now proceed to describe these orders more particularly, observing that every order consists of three divisions, viz. the *pedestal*, the *column*, and the *entablature*, fig. 1 The *pedestal* consists of a base or plinth, the dado, and the cornice, and it is used, in certain cases, to elevate the column to a necessary height. The *column* includes likewise a base, a shaft and a capital, and the *entablature* consists of an architrave, a frize, and a cornice

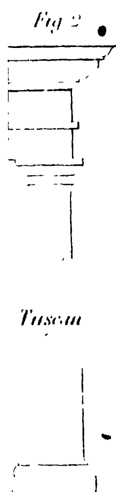
The plinth of a pedestal, takes its name from the Greek, of a brick or flat stone on which columns in the early state of architecture are supposed to have stood. The dado, or, the die, as it is sometimes called from its cubical form, and the cornice takes its name from corona, top or summit.

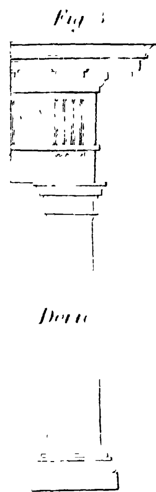
The base of a column is its foundation; the shaft is comprehended between the capital and the base, and is so denominated from caput, the head; the abacus is the upper member of the column, and serves as a covering.

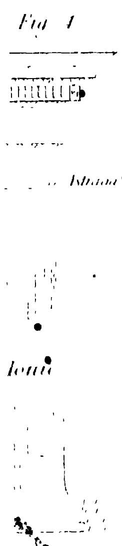
The architrave is so called from two Greek words signifying "principal beam," because the architrave is the chief support of the whole entablature. The frize is a large flat face,

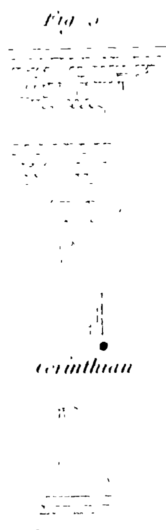
ARCHITECTURE.

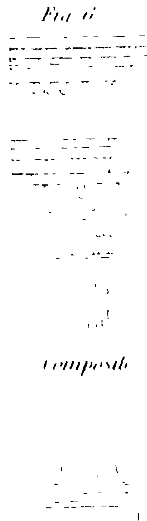












which is sometimes enriched with figures. The cornice crowns the whole

The parts of a complete order, excepting the dado and shaft, are composed of small members; as the *torus* or swell above the plinth: the *astragal*, a round member which terminates the extremities of the column: the *scotia*, a hollow moulding used in bases, so called on account of the strong shadow which its concavity produces.

The five orders already enumerated are distinguished from each other by the column with its base and capital, and by the entablature. To begin with the most simple, the *Tuscan*, fig 2, is characterised by its simplicity and strength. It is devoid of all ornament. The *Doric*, fig. 3, is enlivened with ornaments in the frize and capital. The *Ionic*, fig. 4, is ornamented with the volute scroll, or spiral horn. Its ornaments are in a style of composition between the plainness of the Doric, and the richness of the Corinthian. The *Corinthian* order, fig 5, is known by its capital being adorned with two sorts of leaves; between these rise little stalks, of which the volutes that support the highest part of the capital, are formed. The *Composite*, fig 6, is nearly the same as the Corinthian, with an addition of the Ionic volute.

Each column has its particular base; the Tuscan is the most simple, having only a torus, and plinth; the Doric has an astragal more than the Tuscan. To the Ionic base the torus is larger, on a double scotia, with two astragals between The Corinthian base has two toruses, two scotias, and two astragals The composite base has one astragal less than the Corinthian See BALUSTERS, and also GOTHIC ARCHITECTURE

[The progress of what is called *Gothic* architecture, which, if it does not exhibit so much taste and simple beauty, implies more skill than the *Grecian*, is this:

First we had the plain Saxon architecture with the round arch, from A. D. 1000 to A. D. 1300 Then the Normans enlarged and ornamented the Saxon arch, adding zig zag carvings and mouldings. After the Crusades, the ramified windows, the pointed arch (which the Moors derived from the Hindoos, for it is common in all the ancient buildings of Hindoostan); the columns divided into or formed of many small pillars, the fantastic capitals, and coarse grotesque ornaments, came into fashion.

About 1450 the highly ornamented Gothic took place, wherein a rich mass, struck the eye, of highly carved and moulded small ornaments: a congeries of small pillars and high pointed arches.

In the seals of the Kings of England H. 3, A. D. 1259. is seated amidst an assemblage of round Saxon arches. So are Ed. 1 and Ed 2. Ed. 3. A. D. 1330, is the first whose seal exhibits the Saracenic pointed arch

See Essays on Gothic Architecture, 3 Edition, 8vo. London, 1808.

The periods when the various styles of architecture were introduced, or in vogue in England, are as follows:

The Anglo-Saxon, plain, unornamented, with the round arch, from A. D. 597 to 1066.

The Anglo-Norman, still with a round arch, but larger edifices and ornamented, from A. D 1066 to 1189.

Richard I. returned from the Crusades, 1194. These wars continued for a century afterwards

The English style, founded to a certain degree on the Saracenic, with the pointed arch and ramified windows, was introduced about 1189.

The English decorated style, 1272 to 1461.

Highly decorated Anglo-Gothic from 1461 to 1509.

Anglo-Italian during Hen VIII Eliz. and James I. To these succeeded the Roman architecture under INIGO JONES at Whitehall, next under SIR CHRISTOPHER WREN, at St. Paul's.

During the reign of George III the simple taste for Roman and Grecian architecture has degenerated; and intermixtures of modern Gothic and Chinese have been in fashion —T C.]

Argils See ALUMINE.

ARISTOCRACY, an hereditary government, composed of the nobles, or superior citizens of a country: such was the government of Venice.

Aristolochia See BIRTHWORT.

ARITHMETIC is the science of numbers, and it teaches the method of computing by them. The Greeks made use of the letters of their alphabet to represent their numbers The Romans followed the same method, and besides characters for each rank of classes, they introduced others for five, fifty, five hundred, &c. As for example

One.	Five.	Ten	Fifty.
I	V	X	L

One hundred.	Five hundred.
C	D

A thousand
M

Now it is evident that with these seven letters any number may be represented, by repetition and combination, thus XXX stand for three tens or thirty: CCX for two hundred and ten, and so on.

The general rule with regard to the addition and subtraction of these letters is this: when a numeral letter is placed *after*, or on the right hand of one of greater value, their values are to be added, thus XVI stand for sixteen, and MDCCCXIX for the date of the present year, 1819. But when a numeral letter is placed *before*, or on the left hand of one of greater value, the value of the less is taken from that of the greater, thus IV stand for five less one or four: XC one hundred less ten, or ninety.

The method of notation that we now use is said to be taken from the Arabians, and the characters by which all the operations of common arithmetic are performed are these, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. The first nine are called significant figures, which when placed singly denote the simple numbers subjoined to the characters; but when several significant numbers are placed together the first or right hand figure only is to be taken for its simple value. the second signifies so many tens, the third so many hundreds, and so on: thus, in the number 55555 the right hand figure stands for five only; the next stands for fifty; the third for five hundred; the fourth for five thousand, and the fifth for fifty thousand, and so on. The cypher in any place denotes the want of a number in that place, thus 60 denote six tens, and no simple number; 503 denote five hundred and three, there being no significant figure in the ten's place.

The whole art of arithmetic is comprehended in various modifications of the four rules, Addition; Subtraction; Multiplication; and Division. We refer the reader to any of the common school books for farther illustrations and examples: that by Joyce is the most simple and best adapted for learners, and that by Bonnycastle, is particularly useful to teachers, as giving explanations of the theory and principles on which the science is founded.

There have been various mechanical helps to the attainment of the early rules in arithmetic, we shall insert the following tables, with an explanation, which have been regarded as a sort of toy or puzzle.

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
1	2	4	8	16	32
3	3	5	9	17	33
5	6	6	10	18	34
7	7	7	11	19	35
9	10	12	12	20	36
11	11	13	13	21	37
13	14	14	14	22	38
15	15	15	15	23	39
17	18	20	24	24	40
19	19	21	25	25	41
21	22	22	26	26	42
23	23	23	27	27	43
25	26	28	28	28	44
27	27	29	29	29	45
29	30	30	30	30	46
31	[illegible]	31	31	31	47
33	34	36	40	48	48
35	35	37	41	49	49
37	38	38	42	50	50
39	39	39	43	51	51
41	42	44	44	52	52
43	43	45	45	53	53
45	46	46	46	54	54
47	47	47	47	55	55
49	50	52	56	56	56
51	51	53	57	57	57
53	54	54	58	58	58
55	55	55	59	59	59
57	58	60	60	60	60
59	59	61	61	61	61
61	62	62	62	62	62
No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.

These columns of figures are to be written or pasted on sl[illegible]ard-board, ivory, bone, &c.; which are to [illegible] into the hands of a person to fix upon a number, and having done so, he returns the cards, and *on which the number fixed on is found*, and his friend tells him instantly, by *addition*, what number he has selected; this is done by adding together the top figures on the cards returned.

Examples. (1.) Suppose he fix on 18, then he will return the cards, No. 2, and 5, because 18 will be found on those only, and the top figures of those cards are 2 and 16, which added together give 18

(2.) Suppose he fix on 41, then he will return No 1, 4, and 6, and the top figures in these are, 1, 8, and 32=41.

(3.) Suppose he fix on 58, then he will return No. 2, 4, 5, and 6, and the upper figures on these are 2, 8, 16, 32 =58.

For subtraction, the method is equally obvious; and in this case, the cards are to be returned which have *not* the

number, and the upper figures added together, and their sum subtracted from 63 (which is the sum of the top figures on all the cards) will give the number fixed on.

Examples. (1.) Suppose a person fix on 41, as above, then for an exercise in subtraction he will return the cards, No 2, 3, and 5, the top figures of which are 2, 4, 16=22, and 22 taken from 63 leave 41.

(2) Suppose he fix on 51, then he will return No. 3, and 4, the top figures of these are 4 and 8=12, and 12 from 63 gives 51, and so of all other numbers.

ARMILLARY SPHERE, an artificial sphere composed of [illegible] number of circles put together in their natural order to assist the imagination in conceiving of the motions of the celestial bodies. This sphere revolves on its axis with a silvered horizon, which is divided into degrees, and moveable every way upon a brass supporter The other parts are the equinoxial, zodiac, meridian, tropic, and polar circles.

AROMATIC, an epithet given to such substances as yield a strong fragrant smell, and impart a warm taste. In this class are included the various spices, such as nutmegs cloves, cinnamon, mace, &c. Some of them have a sweetness mixed with their aromatic principle; such as the angelica root, anise seed, and fennel; some are astringent, as cinnamon; others afford a strong mucilage, as the *Cassia lignea;* [illegible], others a bitterness, as orange and lemon peel.

The aromatic ingredient is extracted in different proportions from various substances, by rectified spirits of wine; though it is sometimes obtained by mere infusion with water.

Aromatics form an useful and agreeable ingredient in many articles of cookery, but especially in dishes prepared of watery and flatulent vegetables, of which they are the best correctors: they warm the stomach, and stimulate the whole system; raise the pulse, and quicken the circulation. In cold, languid habits, and a relaxed state of the solids, they support the animal spirits, or increase vital action, and promote the salutary secretions: but to hot, bilious temperaments, full habits, and inflammatory dispositions, they are certainly pernicious.

ARQUEBUSADE WATER, a medicinal preparation, which has received this name, from its supposed, but ill founded, efficacy in healing gun-shot wounds, though it is, at present, with more propriety, applied to bruises, tumours arising from blows, and particularly to suggillated parts, containing coagulated blood.

The virtues of these healing waters are more imaginary than real: for most wounds, nothing more is required, than to join the separated parts, and bind them up in the effused blood: the separated vessels will soon unite. In warm weather, the parts may be covered with a cloth dipped in spirits or brandy. No remedy, for a bruise, is equal to an ounce of sal ammoniac dissolved in a pint or a pint and a half of vinegar, with which the parts must be bathed every hour, or oftener.

ARRACK, ARAC, OR RACK, is a spirituous liquor imported from the East Indies, and used either as a cordial, or an ingredient in punch. It is obtained by distillation from rice, or sugar, fermented with the juice of cocoa-nuts. Goa and Batavia are the chief places from which arrack is exported At the former, there are three sorts, viz. the single, double, and treble distilled. The double is but a weak spirit, in comparison with that obtained at the latter place; but, on account of its peculiar flavour, it is preferred to all the others. [It is used in England for the sole purpose of giving a flavour to punch; one part arrack, two parts Jamaica spirit, and one part brandy —T. C.]

A spirituous liquor of this name is also extracted by the Tartars of Tungusia, from mare's milk, which is first suffered to turn sour, and then distilled two or three times, between two close earthen pots, from which it runs through a small wooden pipe. It is possessed of the most intoxicating qualities; so that, according to Professor PALLAS, men, women, and children, frequently drink themselves into a semi-delirious trance, which continues for 48 hours

ARRACK, is said to be an Indian name for all spirituous liquors. What in Europe is called arrack, is procured by distillation from a vegetable juice, called *toddy,* which flows by incision out of a cocoa-tree The Goa-arrack appears to be made from the toddy, and the Batavia-arrack from rice and sugar. The manner of making the Goa arrack is this: a man provides himself with a number of earthen pots, resembling bird bottles, and with these fastened to his girdle, or in any other tolerably commodious manner he climbs up the trunk of the cocoa-tree. When he

comes to the boughs, he takes out his knife, and, cutting off several of the small knots or buttons, he applies the mouths of the bottles to the wounds, fastening them with bandages. The next morning, he takes off the bottles, the greater part of which are generally filled, and empties the juice into a proper receptacle, where it is left to ferment. When the fermentation is over, and the liquor or wash is become a little tart, all the spirit that it will yield is drawn from it, by the process of distillation. It is remarkable that all savage nations with which we are acquainted, have found means to manufacture ardent spirits of some kind or other.

ARROW ROOT, Indian, or the *Maranta*, a plant of which there are three species, the *arundinacea*, *galanga*, and *comosa;* all of them are herbaceous, perennial exotics of the Indies, and kept in our hot-houses merely for curiosity. The first of these species is the true *starch plant.*

The arrow root powder unquestionably yields a large proportion of nutritive mucilage; hence a single table-spoonful of either, makes a pint of strong and nourishing jelly, which affords a very proper food in acute diseases as well as in all those complaints where animal food must be abstained from.

The arrow root furnishes an excellent remedy for the bowel complaints, which so commonly prevail in the United States, during warm weather, especially among children. The plants would thrive in the southern states, and ought to be introduced into them, by some of the numerous Americans who visit the West Indies [Magnesia is a much better remedy.—T. C.]

ARSENIC, an heavy, opaque, crystalline, metallic substance. Many metallic ores contain it, in greater or less proportion, especially those of tin, bismuth, and cobalt, from which last it is extracted in Saxony by sublimation. It is ranked among the semi-metals; and it may, by various processes, be made to assume either a saline or metallic state. Hence, it is considered as a mineralising substance, which tends to combine with metals and convert them into ores.

This semi-metallic concrete is very usefully employed in various branches of the arts and manufactures; it is added as an ingredient, to facilitate the fusion of glass, and to produce a certain degree of opacity. Combined with sulphur, painters use two arsenical preparations, namely, the orpiment and realgar. A very beautiful green pigment may be precipitated from blue vitriol, by a solution of white arsenic in potash, taking equal weights of each: this is SCHEELE'S green pigment: and when prepared either with water or oil, affords a permanent colour It is highly probable that, if arsenic were added to the paint used for wood, it might form an ingredient which would not be liable to be preyed upon by worms. But the practice of painting the toys of children with arsenical pigments, deserves severe censure; as they are accustomed to put every thing into their mouth.

In dyeing and shot making, it is likewise of great service. Combined with sulphur, it has the property of readily disoxyding indigo; for which purpose it is used in the printing of calico, and other cloths

[Arsenic with charcoal may be sublimed by heat into a semi-metal; it is the fly-stone of the shops —T. C.]

In medicine, it has long been known as the basis of the most celebrated *cancer powders*, especially those of PLUNKET, Dr. HUGH MARTIN, and probably also, of GUY'S. A weak solution of it in water, is directed by Dr. WAY, of Wilmington, as effectually cleansing foul ulcers, and [illegible] the impurities of the skin: it is prepared by boiling one ounce of white arsenic in two quarts or three pints of water, and applying it once or twice a day. When it is used for extracting or discussing cancerous or schirrous tumors, that are not ulcerated, the above mentioned Dr. MARTIN, a late physician in America, previously ordered a blister of Spanish flies to be applied to the part, with a view to open the pores of the skin. But, as he prescribed it empirically, and indiscriminately, in *all* cancerous cases, we were not surprised to learn from his old professor Dr. BENJAMIN RUSH, that his pupil has often been unsuccessful in the application of his arsenicated powder.*

In the cure of *agues*, a solution of this mineral has been strongly recommended, and administered with suc-

* It is presumed, that the liquid medicines, now *secretly* exhibited by a physician in London, who positively maintains *that he cures cancers* "by absorption," likewise consist of solutions made of this virulent semi-metal. See CANCERS.

cess, upon the authority of Drs. FOWLER, ARNOLD, WITHERING, WILLAN, MARSH, PEARSON, and many other respectable English and foreign practitioners, who do not hesitate to prescribe it in doses, from 2 to 12 drops, once, twice, or oftener, in the course of the day, according to the age, strength, and other circumstances of the patient.

[Fowler's drop is made by boiling 64 grains of salt of tartar, and as much white arsenic, in a wine pint of pure water: 70 grains of the salt of tartar is a better proportion.—T C.]

A preparation similar to that directed by Dr. FOWLER, and called the white tasteless *ague drop*, has lately been given with singular efficacy in the hooping cough. We relate this fact upon the evidence of Mr. CROP, an eminent surgeon, of Barnet. [Dr. FERIAR also recommends it in this disorder.—T C.]

Artists exposed to the fumes or vapour of this volatile mineral, ought to be extremely cautious to preserve themselves from its influence on their mouth and nostrils, as well as from touching it heedlessly with their hands; for every external contact may be attended with serious consequences. Hence they should keep at a proper distance from the exhaling fumes, and cover the orifices of the face with a mask, made for the purpose. In their system of diet, we advise them to make use of a great proportion of bland and mucilaginous nourishment; such as butter, pork sweet oil, milk, artichokes, and similar vegetables.

With respect to the treatment of persons, after the inhalation, or swallowing of arsenic, we shall arrange the subject under three distinct propositions

I. *When a large portion of arsenic has been introduced into the stomach, or inhaled by the lungs:*

1. *Immediately after the accident*, brisk emetics; for instance, half a drachm of white vitriol, and, after it, plenty of sweet linseed, or almond oil, either of which is preferable to olive oil; or, if these be not at hand, large draughts of milk, barley-gruel, or warmed beer, with a third part of oil, or butter, ought to be substituted, as soon as possible. To facilitate the operation, a strong feather should be dipt in oil, for stimulating the tonsils. If the throat be swollen and contracted, a surgeon ought to be instantly procured, for opening the gullet by means of a probe, or other proper instruments.

2. To neutralise and deprive this corrosive poison of its activity, according to Dr. HAHNEMANN, nothing is more efficacious than a solution of white soap in hot water, in the proportion of half a pound of the former to a quart of the latter, which must be boiled, and the soap agitated until the whole is dissolved; when it may be sweetened with sugar. This preparation ought to be taken without delay, and so frequently as to repeat half a tea-cupful of it every five minutes, that the patient may swallow several pounds in the course of two hours. If hepatised water prepared by dissolving liver of sulphur, could be readily procured, it would, with the addition of cream, be an excellent substitute for the solution of soap.

3. To promote the evacuation of the poison by stool, clysters composed of the preceding liquids, and a third part of castor-oil, ought to be speedily administered, and the whole abdomen fomented with soap-water.

4 With a view to prevent local or general inflammation, beside the fomentations, cataplasms, luke-warm baths and clysters, it will, perhaps, be necessary to bleed the patient largely, but not without consulting medical men.

II. *When a person has been slowly poisoned, or has swallowed only a small portion of arsenic; or, if the proper remedies should have been neglected for several hours:*

In these cases, the judicious practitioner only can decide upon the relative propriety and expediency of the preceding remedies; but if a considerable time has elapsed since the accident happened, it will be necessary to commence the treatment with purgative remedies, such as will at the same time lubricate the coats of the stomach, and the whole intestinal canal, while they tend to assuage the acrimony, and counteract the corrosive effect produced on the first passages. Of this nature is, in a pre-eminent degree, the castor-oil, combined with large draughts, either of the hepatised or soap waters. A strictly antiphlogistic regimen ought now to be pursued, together with the remedies proper to obviate inflammation, and afterwards a milk diet, linseed tea, barley-water, gruel, and infusions of different mucilaginous vegetables, milk, chocolate without spice, aided by the enjoyment of fresh and pure air.

III. *Indications of cure, when the pa-*

tient labours under a gradual and long-continued action of the poison; or in the secondary stages of the two former casualties.

The principal object now to be attained, is the destruction of poisonous matter in the second passages, or to prevent its influence on the kidneys, biliary ducts, the organs of perspiration, &c. To ascertain whether the virus has diffused itself through the system, the person's state of mind and body should be comparatively examined; whether the former be dejected, or the latter reduced to preternatural debility; or whether any of the animal and natural functions be impaired. When there appears a blue ring round the eyes, and the lips exhibit a similar colour, we may conclude that the devastation occasioned in the whole frame is considerable; and in such instances, Dr Boerhaave advises to let the patient drink no less than *twelve pints* of lukewarm honey-water, in 24 hours, for 3 days successively; and to administer frequent clysters of the same liquid. By this simple treatment, he observes, all those painful and dangerous symptoms, which sometimes afflict the victims of this poison through the remainder of their lives, have been effectually obviated. On the contrary, M. Navier, a reputed French writer, on the effects of arsenic and its antidotes, recommends the method we have already pointed out, in propositions I. and II after which, he insinuates the propriety of recommencing a milk-diet, and enjoins the patient to abstain from the use of all acid substances, or liquors. In this opinion, he is likewise supported by Dr. Hahnemann, who cautions the convalescent to be very attentive to his evacuations by stool; which, so long as he is subject to griping pain, and strictures in the abdomen, constantly requires to be aided by the mildest purgatives.

In order to prevent all the bad consequences resulting from this malignant poison, the patient may with advantage resort to the warm mineral, sulphureous waters, which he should not only drink plentifully, but likewise bathe in them, especially in the form of vapour. If such natural waters cannot be easily procured, they may be artificially substituted by medical men, who are, in general, perfectly well acquainted with their component parts, as well as the manner of preparing them. By their proper use, the unfortunate invalid may at length recover from that tremulating affection of the limbs, relaxation, paralysis, convulsions, and other distressing complaints, which the improvident swallowing of arsenic usually produces.

Lastly, we shall briefly mention, by what means and processes it may, after death, be discovered, whether a person have died from the poison of arsenic, though this knowledge properly belongs to the department of medical police or jurisprudence.

1. The contents of the stomach and intestines should be taken out, and washed in water. If any powder be contained therein, it should be allowed to separate; and if this be arsenic, it will fall to the bottom.

2. Place the separated powder rubbed up with twice the quantity of charcoal in fine powder on a red-hot iron; and, if it evaporate in a thick white vapour, without melting, there is reason to conclude that it is arsenic, this effect will take place with the fortieth part of a grain.

3. If this powder be mixed with charcoal, and emit an odour resembling that of garlic, we may also infer that it is arsenic.

4. Inclose the mixed powder with the charcoal, between two small polished plates of copper (or between two perfectly smooth halfpenny pieces,) the edges of which must be fastened with a thin wire, and expose the whole to a red heat: thus the arsenical powder will be metallised; thus penetrating the copper, a blackish skin will first appear upon it, which being rubbed off, the parts touched by the arsenical vapour will acquire a whitish or leaden colour.

[5 The most indubitable test is this add to the substance found in the stomach, when dried with a gentle heat, twice its weight of charcoal powder Mix accurately. Then put the mixture into the bottom of a glass tube, about half an inch (or less) in diameter. Loosely cork the upper end of the tube which may be six or eight inches long Expose the closed end of the tube where the mixture is, to a gradual heat. If there be arsenic, it will sublime to the upper part of the tube in black metallic crystals, which thrown on hot coals will give a garlic smelling fume, and will whiten copper. T C.]

[6. Take the substance suspected, add to a grain of it a few drops of chromate of potash on a watch glass. In about 3 hours there will be a decided green colour if the suspected substance be

arsenic. If the poison be copper, the chromate of potash will instantly produce an orange coloured precipitate.—T. C.]

ARTEMISIA DRACUNCULUS, *Estragon*, or *Tarragon*, *Fr.* is frequently used in salads, especially by the French, to correct the coldness of other herbs. The leaves make an excellent pickle: they have a fragrant smell, and aromatic taste. The use of them in Persia has ever been general, at meals, to create an appetite. The famous vinegar of Maille, in France, owes its superior flavour to this plant, which is now common in Pennsylvania. There are several other species of Artemisia.

Artemisia Absinthium. See Mugwort.

ARTERY, or a pulsating blood-vessel, is a cylindrical canal, conveying the blood immediately from the heart to all the parts of the body. On examining the structure of the largest of these vessels, such as the *aorta*, and the pulmonary artery, it may be distinctly seen, that each is composed of three coats, namely, 1. The external coat, which is of a cellular texture, loose on the outside, but growing progressively firmer towards the inner part; 2. A fibrous spiral, or rather circular membrane, of a yellowish colour, and of which there are several strata, according to the size of the artery; 3. The innermost coat, or a thin, extremely smooth and transparent membrane, keeping the blood in its canal, which otherwise, upon the dilatation of an artery, would easily separate the spiral fibres from each other.

From the trunk of every artery there arises branches; from these again extend ramifications of blood-vessels, which become progressively smaller, so that their distribution may be traced by the microscope, in more than twenty different divisions, nay, to an almost infinite number. The arteries, however, do not, as has been erroneously asserted by several anatomical writers, become narrower, and assume a *conic* form in their continued progress; on the contrary, they seem uniformly to remain *cylindrical*, insomuch that, in their ramifications, a smaller cylinder always arises from a larger one, and where the former proceeds from the latter, it generally presents a slight swelling at this vascular joint, if this expression be admissible. The aggregate diameter of all the branches of one trunk is somewhat larger than that of the trunk itself; an observation which also applies to the veins.

On account of their thicker membranes, the arteries possess a greater degree of elasticity than the veins; though the latter are more capable of resisting the mechanical force of the blood, and are less liable to rupture. It farther deserves to be remarked, that, with the increase of years, the coats of the arteries acquire firmness, while those of the veins become weaker. This, in some measure, accounts for the circumstance that persons between the age of eighteen and thirty-five, are more liable to phthisical and other complaints, which depend chiefly on an increased action of the arterial system; because, after that period, the arteries already possess sufficient vigour and firmness, to overcome the additional impetus of the circulation. Hence, too, we may comprehend why sthenic or inflammatory diseases seldom occur at certain stages of life, when the whole system possesses that degree of re-action, which is necessary to maintain a due equilibrium between the animal and vital functions, as well as to resist the occasional impressions made on the body, by sudden vicissitudes of heat and cold, moist and dry air, &c.

All the arteries derive their origin from the ventricles of the heart: namely, the pulmonary artery, from the right, and the aorta from the left; of which two the rest are branches. They terminate in veins, exhaling vessels, or *anastomose* with one another, that is, unite by inosculation. It is asserted by physiologists, that the circulation of the blood, its heat, red colour, fluidity, assimilation of food, &c. the conversion of fixed into volatile salts, and the performance of the different secretions, such as bile, urine, saliva, &c. all must be attributed to the contractile power of the arteries and the heart. See Assimilation, Bile, Blood, Chyle, Saliva, Urine, &c.

It is farther worthy of notice, that an injury received by a very considerable vein, is not nearly so dangerous as that of a small artery, especially in the vicinity of the heart: (See Bleeding or *Hemorrhage*;) and that single arteries sometimes become *ossified*, or acquire a cartilaginous and bony consistence. In the larger ones, this phenomenon rarely occurs: yet a very remarkable instance of an ossification of the aorta

is recorded by Dr. ZIMMERMAN, in his work "*On Experience in Physic.*"

Arthritis See GOUT

ARTICHOKE, or the *Cynara*, L. though an exotic, is a plant well known. There are four species, but only two are reared for use, viz the *scolymus*, or garden artichoke, and the *carduncułus*, or cardoon, both of which are propagated by slips, or suckers, arising in spring, from the roots of the old plants. The slips should be taken from good plants in March, or the beginning of April, and set in an open quarter of the kitchen garden, in rows at the distance of five feet from each other. By this process, artichokes may be produced in the autumn of the same year. The size of their fruit will gradually diminish, after the third or fourth year, though the roots continue sound for several seasons. The cardoon, which is a hardy plant, may be propagated by seeds sown in March. As these plants are very large, they ought to be placed at the distance of several feet from each other; and thus crops of spinach, endive, cabbage, or brocoli, may be raised between the rows. About the 28th September, the cardoons generally attain to a considerable size; the leaves of each plant should then be tied, that they may be hoed, for the purpose of blanching; which will require six or eight weeks Thus the plants will be fit for use in November or December, and continue the whole winter

Artichokes flourish best in a rich and moist soil; but if it be too wet, the roots are apt to decay in severe frosts. They have been used with advantage in the making of Soda; and the leaves of the *scolymus*, prepared with bismuth, impart to wool a fine and permanent gold colour.

Artichokes succeed very well in this state, if left exposed in the winter months. When covered with straw in the autumn, they rot. The only precaution necessary to take, is to dig a ditch round the plant, to prevent the water from injuring them. For this very useful information, the Editor is indebted to Mr. LEGAUX, of Springmill. His artichokes were eight or nine inches diameter. The seed was imported from Holland.

ARTICHOKE, the *Jerusalem*, is a plant of the same genus as the sunflower. It produces bulbs at its roots, has been long cultivated in gardens, as an esculent vegetable, and, except that it is watery and of a softer consistence, in many respects resembles the potatoe, but though well deserving, is not in such general esteem. This root, however, is much valued for feeding hogs and store-pigs. Mr. PETERS, the author of "*Winter Riches*," published in the year 1772, asserts. that from one acre of ground, he obtained between seventy and eighty tons of this root He is of opinion, that seven acres will yield three hundred and ninety-six tons, which will keep one hundred swine for six months, allowing each head fifty-six pounds per day, at an advance of value from ten to fifteen shillings, especially if they be boiled with *sweet* hog-wash.

When these roots are given to horses, they should be washed, cut, and ground in an apple-mill; the proportion given at each time is eight pounds, with two ounces of salt, and a bite of hay, thrice daily.

Another celebrated cultivator found the produce of this root to be about four hundred and eighty bushels Winchester measure, per acre, without any dung. Its chief recommendations are, the certainty of a crop; its flourishing almost upon any soil; not requiring manure, and being proof against the severest frosts. The culture is the same as that of potatoes. [It is in flavour exceedingly like the common artichoke, (*Cynara*). It is very hardy, and stands frost better than the potatoe. It is difficult to extirpate it —T. C.]

ARTICULATION, in language, is the division of sounds into distinct syllables; and consists in giving every letter its due proportion of sound, so that the hearer may perceive and determine their number without difficulty; while he is enabled to ascertain the respective letters in every syllable.

The late Mr. THOMAS SHERIDAN, however, has endeavoured to prove, in his "*Course of Lectures on Elocution*," published about the year 1762, that the *English* language is by no means calculated to answer the purpose of reading aloud to others. This strong-headed grammarian maintains, that as our *written* language has no *visible* marks of articles, it is defective in the most important requisites for a just delivery of speech.

A *just delivery*, we are told consists in a distinct articulation of words pronounced in proper tones, suitably varied to the sense and emotions of the mind; with due observation of accent; of emphasis, in its several gradations; of rests or pauses of the voice, in pro-

per places, and well measured degrees of time; and the whole accompanied with expressive looks, and significant gestures. Of these essential characters, two only are at all regarded in the art of writing: namely, articulate sounds, or words, which are marked by letters; and stops, or pauses of the voice, which are denoted by little figures or titles.

But with respect to the other articles, of tones, accent, emphasis, and gestures, there are no visible marks to guide the reader; these, it must be allowed, are the sources of all that is pleasurable or forcible in delivery: and contain in them all the powers of impressing the mind, captivating the fancy, rousing the passions, and delighting the ear: and it must also be admitted, according to our author, that the articles most essential to a good delivery, have been entirely neglected in the graphic art.

Of the numerous instances of imperfect, or vitiated articulation, according to Mr. Sheridan, there is not one in a thousand which arises from any natural defect or impediment.

"To cure any imperfection in speech, arising originally from too quick an utterance, the most effectual method will be (Mr. Sheridan says), to set apart an hour every morning, to be employed in the practice of reading aloud, in a very slow manner. This should be done in the hearing of a friend, or some person, whose office it should be to remind the reader, if at any time he should perceive him mending his pace, and falling into his habit of quick utterance. Let him sound all his syllables full, and have that point only in view, without reference to the sense of the words; for, if he is attentive to that, he will unwarily fall into his old habit:" on which account, that he may not be under any temptation of that sort, Mr. Sheridan would have him, for some time, read the words of a vocabulary, in the alphabetical order. In this way, he will soon find out what letters and syllables he is apt to sound too faintly, and slur over. Let him make a list of those words, and be sure to pronounce them over distinctly, every morning, before he proceeds to others. Let him accustom himself also, when alone, to speak his thoughts aloud, in the same slow manner, and with the same view. Otherwise, though he may get a habit of reading more slowly, he will fall into his usual manner in discourse: and this habit of speaking aloud, when alone, will not only bring him to a more distinct utterance, but produce a facility of expression, in which silent thinkers are generally defective. See the articles Language, Reading, Speech

ARTILLERY, FLYING, a modern invention, of the utmost value in the operations of war. A small cannon, as a six pounder, is slung between two horses; and these tractable animals are accustomed by practice, to stand while the piece is discharged between their heads. Beside the originality of the thought, the merit of this contrivance consists in the disposition of the leathern gear, by which the horses are saved from the shock attendant upon the recoil of the cannon. The great utility of this invention is obvious. The heavy artillery has always been an extreme incumbrance upon the march of an army; to bring it to the place of an action, is a work of time, as well as labour; and in case of precipitate retreat, it can seldom be carried away: the *flying artillery* keeps pace with the most rapid march of the troops; can be galloped from one part of the field to another; and, being harnessed during the whole action, retires as swiftly as the cavalry itself. It is said to have been the invention of a professor in the university of Edinburgh.

ARUNDELIAN MARBLES, called also the Parian Chronicle, are ancient stones, on which is inscribed a chronicle of the city of Athens, supposed to have been engraven in capital letters, in the island of Paros, 264 years before Christ. They take their name from the earl of Arundel, who procured them from the east, or from his grandson, who presented them to the University of Oxford The authenticity of these marbles has led to a controversy between Mr Robertson, who in his Parian Chronicle questioned it, and Mr. Hewlett, who defended it in a Vindication of the Authenticity of the Parian Chronicle.

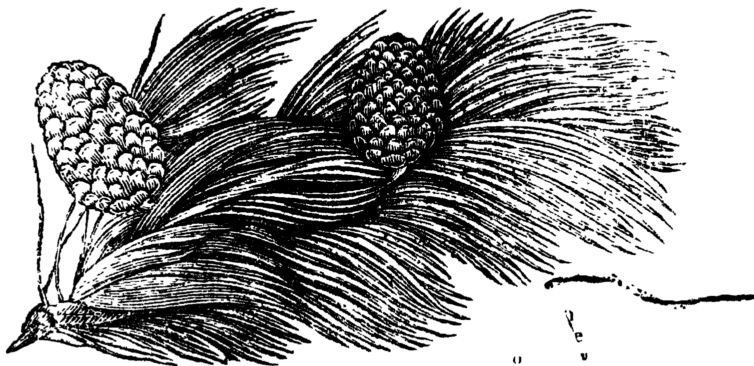
ARVENUSLY, or *Pinus Cembra*. L. is a species of pine, which is principally found in Siberia, and on the Alpine mountains Its branches resemble those of the pitch-tree, which is commonly called spruce-fir. The leaves are of a striated form, about three inches in length, and the fruit about the size of a large hen's egg, containing kernels covered with a brown skin, which, when peeled, are as large as a common pea, white and soft as a blanched almond, and of an agreeable taste.

The arvenusly is applied to various purposes of useful and domestic economy Its planks afford excellent wainscoting, flooring, and other materials for joiners; are of a finer grain, more beautifully variegated, and of a more agreeable smell, than deal. The white wood has a very pleasant fragrance; and when made into shelves, is said to possess the remarkable property of keeping away moths and other insects. It also furnishes excellent fuel for stoves, ovens and kilns; but is dangerous when used in grates, being liable to splinter, and throw out sparks to a considerable distance. From the resinous parts of this tree, is distilled a fragrant oil, resembling in taste and flavour that of juniper, and possessing the same properties. An expressed oil is also obtained from the fruit, which, on account of its balsamic nature, has been recommended in consumptive cases; and the kernels are employed, by the SWISS, as a substitute for mushrooms, in ragouts, and sometimes form a part of their desserts.

The arvenusly is of a healthy and vigorous nature, and will bear removing, when young, even in dry and warm weather. It likewise grows in great abundance on the most mountainous and coldest parts of the Brianconnois, where the natives call it *alvies*. It bears some resemblance to the Canada, or Weymouth pine.

This tree is the more valuable, as its timber is fit for the choicest furniture; and from its enormous height and size, when full grown, it would make excellent masts. As the culture of this remarkable tree in no respect differs from the other species of the PINE, we refer to that article.

We have here subjoined a branch of the arvenusly, of a reduced size, to distinguish it from other species of the same genus.



AS, a weight used by the ancients, consisting of 12 ounces: it was also used as a coin, and as an integer divided into 12 parts.

ASAFŒTIDA, a gum-resin, so called on account of its offensive smell. It is obtained from the *Ferula asafœtida*, L. an umbelliferous plant, growing wild in Persia; the root of which, on cutting it, exudes a milky juice: by evaporation, it acquires the consistence of wax, and a yellowish red colour. We have seen fine specimens of this plant in the *Botanical Garden* at *Edinburgh*; and there is no doubt that it will bear the vicissitudes of our climate, in the open air; and that it is strongly impregnated with its peculiar juice.

Although this nauseous drug possesses a bitter and acrid taste, which is much stronger, when fresh, the Persians nevertheless use it as a spice with their food; so that our epicurean imitators do not deserve the credit of original choice.

Asafœtida is one of the most valuable medicines in spasmodic, flatulent, hysteric and hypochondriacal complaints, especially when they arise from obstruction of the bowels. But as it is of a heating nature, it increases the circulations of the fluids, and ought not, therefore, to be employed either in violent fevers, or in constitutions liable to hemorrhages. On the contrary, where spasms and constipations have contributed to weaken the powers of nature, and the functions are in a languid state, it generally affords effectual relief; as it promotes digestion; enlivens the animal spirits; and, by increasing the peristaltic motion of the intestines, tends to open them in

persons of an advanced age. In the spasmodic, as well as in humoral asthma, unattended with fever, it is an excellent remedy; for, in the former, it counteracts the strictures of the respiratory organs; and, in the latter, greatly facilitates expectoration. The hooping-cough has been cured, and worms have frequently been expelled, by the conjoined administration of asafœtida, both by the mouth, and in the form of clysters When given with the last mentioned intention, it is very usefully combined with jalap; by the assistance of which it possesses uncommon powers over the tape worm, especially in adults Thus, according to C. J. Mellin, an elderly lady was relieved of a formidable tape-worm, together with a considerable portion of coagulated and viscid matter, resembling a fishing-net, after making use of the following pills: Take asafœtida, half an ounce, powder of jalap, two drachms; let them be mixed with any syrup, to a proper consistence for making sixty pills: two of these are to be taken every morning and evening, at first; but gradually increased to four or five, according to circumstances.

ASARABACCA, in botany, the *Asarum Europæum*, L. A good representation of it is given in Dr. Woodville's *Med. Bot.* Pl 86. It produces large bell-shaped flowers of a dusky purple colour, and blossoms in the beginning of May.

As a medicine, the different properties of this plant render it an object of attention: hence Linnæus proposed it as a substitute for ipecacuanha; and, according to Dr. Cullen, "the root, dried only so much as to be powdered, proves in a moderate dose a gentle emetic" But as the internal use of the asarabacca is precarious, the *London College* have justly rejected the *root*, and directed the *leaves* only to be employed as an *errhine*, or sneezing powder, with the addition of one-half of dried lavender flowers. Thus carefully prepared and snuffed in small doses of a few grains, several successive evenings, Dr. Woodville says, "it produces a pretty large watery discharge, which sometimes continues several days together; and by which, head-ach, tooth-ach, opthalmia or inflammation of the eyes, as well as some paralytic and soporific complaints, have been effectually relieved." That such is the effect of this powder, we have frequently observed from experience, though there is reason to doubt whether its action extends to palsy, as it more particularly affects the salival glands, which is obvious from the copious spitting it generally occasions, after being used for a few evenings.

In farriery, the powdered root of this plant is given mixed with bran, to horses troubled with the *farcy*, or leprosy, in doses from one to two ounces —as likewise for worms in either horses or sheep.

Dyers may also usefully employ the fresh leaves or roots of the asarabacca, for producing first an apple-green, and by boiling them still longer, a light-brown colour, on wool prepared with bismuth. These experiments are related by Dambourney, whose work we first quoted, p. 19.

Several species grow in the United States.

1. *A. Canadense*, or, Canadian A.

2. *A. Virginicum*, or sweet scented A. or colts-foot, wild ginger.

These plants delight in a moist shady situation, and may be increased by parting the roots in autumn. Too much wet will rot the Canadian sort in winter. If the second species be too much exposed to the sun in summer, it seldom thrives well; it should therefore be planted in a border where it may have only the morning sun. The juice of the fresh leaves, is emetic. The powder of this plant has been known to answer very good effects in cases of giddiness, unattended by too much fulness. It was used as a snuff. It certainly is an active plant, and deserves further trials. [It is a principal ingredient in cephalic snuff.—T C.]

ASCARIDES, in zoology, belong to the order of *vermes*, and are divided into two species: 1. the *vermicularis*, distinguished by a transverse mouth, and faint annular rugæ, or folds. It is about a quarter of an inch in length, and is found in boggy places: in the roots of decayed plants; and very frequently in the rectum, or straight gut of children and horses. 2. The *lumbricoides*, which is equal in length with the *lumbricus terrestris*, or common earth worm, but wants the protuberant ring towards the middle of the body, which is its only distinguishing mark. Its body is cylindrical, subulated at each extremity; but its tail is somewhat triangular. This is the worm which is most commonly found in human intestines, and its usual seat is the rectum. The symptoms are, an uneasiness and intolerable itching in the anus, which generally take place in the

evening, and sometimes prevent sleep. They are often attended with so considerable a degree of heat, as to produce both an external and internal swelling in that intestine; which, if not quickly relieved, bring on a *tenesmus*, or a frequent inclination to go to stool, accompanied with a mucous dejection. There are also frequent griping pains, in the lower part of the abdomen, a little above the *os pubis*; if these be acute, they are succeeded by a bloody mucous discharge, in which these worms are often found alive.

Mucus, or slime, appears to be the proper nest of the ascarides: in this they live, are nourished, and preserved unhurt, though surrounded with many other fluids, the immediate contact of which, would to them prove fatal. Purges, by lessening this viscous matter, never fail to relieve the patient; for those worms, which are not expelled by the increased vermicular motion of the intestines, for want of a proper quantity, languish, and at last die; as may be seen in those which are taken out of their mucus and exposed to the open air. Such purges, therefore, as act briskly, and can be conveniently repeated, for instance, purging waters, and jalap, especially for children, two grains of which may be mixed with sugar, and taken daily, are the most effectual. When the tenesmus, or mucous stools, are urgent and distressing, a clyster of warm milk and oil will afford immediate relief. The most useful purge is calomel and rhubarb, with aloes, which, when taken, seldom fail to bring away a transparent mucus, containing many of those worms alive.

Dr Mease says, "I have often used the Cabbage-tree bark as a vermifuge, and with success. When made into a syrup, its effects are less violent, and children take it more readily. To make this, boil one ounce and a half of the coarsely powdered bark, in a quart of water, for half an hour; then add the sugar, or give two table-spoonfuls every morning sweetened. In powder, fifteen grains, with as much jalap, is a good purge. But, after all, repeated experience has convinced me, that no remedy is so safe, so mild, or so certain, as calomel. Procure the medicine from an apothecary of character, give it in the dose suited to the age and constitution of the child, and keep him warm during the operation, avoiding cold and sour drinks, for two or three days, and no danger can ever attend the use of the remedy. Rhubarb, or jalap, may be mixed with the calomel, to quicken its operation. A nausea, which sometimes comes on during the operation, may be relieved by mint-water: and an unnecessary purging may be restrained by 2 or 3 drops of *laudanum*. Children, between the ages of two and four years, in general, may take from two to four grains at a dose, in syrup."

ASH, or the *Fraxinus*, L. is a genus of which there are six species. Of these, the most useful is the common indigenous ash, or *Fraxinus excelsior*, L. which is well known to every rural economist.

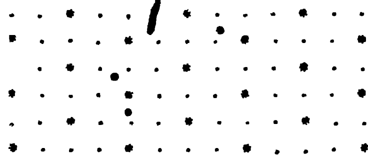
A plantation of these trees, when properly managed, seldom fails to prove of great advantage to the owner; for the underwood, which is fit to be cut every eight or ten years, will produce a regular income, more than adequate to defray the rent of the ground, and other charges; besides which, the trunk or stalk preserved for timber, will be worth forty or fifty shillings and upwards, per tree. It flourishes best in groves, but grows well in the rich soil of open fields: it also bears transplanting and lopping. In the north of Lancashire, in England, they lop the tops of these trees in autumn to feed cattle, when the grass is on the decline.

The ash-tree delights in a rich, light soil; it attains its greatest height and perfection when at an age of from forty to fifty years. Although it also grows in wet and loose soils, yet, when reared in these, its wood becomes less firm and durable. It prospers remarkably well on a white calcareous soil, and is also frequently found in a thriving state near brooks and rivulets.

Planting—The Society for the Encouragement of Arts, &c. at London, considered the cultivation of the ash of so much importance, that, in the year 1779, they gave a premium of twenty pounds, and in 1780, their gold metal, to Mr. Day, of Friendsbury, near Rochester, for an account of his successful method of rearing it. The whole is detailed in the first volume of their Transactions; and we shall only observe, that Mr Day is enabled to plant one thousand trees for two shillings: by his method fourteen acres, three-quarters, and thirteen rod, out of sixteen acres, three quarters, and twenty seven rod, are planted at the distance of four feet, by two. To fill this extent of ground, there required 80,682 plants: two acres and fourteen rods are planted at a distance of two feet, by eight

inches, which takes up 66,400 plants. The reason for planting twice as thick one way as the other, is, that in such manner they are much easier to till. He has ascertained by experience that there is an essential difference between wild ash and those which are trained: hence he advises all the crooked ones to be rejected, and particular attention to be paid in getting the ash-keys. There is another advantage attending his plan, that potatoes may be planted between the rows.

The emulation excited by the above and similar premiums, produced such effects as might be expected to result from so extensive and honourable a patronage. In the year 1790, the gold medal of the Society was adjudged to Lewis Majendie, Esq. of Hedingham Castle, and the silver medal to H. G. Fausset, Esq. of Heppington, near Canterbury. The first mentioned gentleman planted on seven acres and twenty-one poles, of a principally loamy soil, the surprising number of nineteen thousand trees, of four and five years old, at intervals of four feet. In a subsequent paper, Mr. M. recommends the soil to be completely trenched, previous to planting. Mr. Fausset intermixed willow with his ash, and planted them at the distance of three feet and a half, in the proportion of three willows to one ash: so that, on the decay of the willows, the ash plants remain seven feet asunder The following is a sketch of his method: the stars denote the ash, and the dots the willow plants.



The ash, when young, requires constant cultivation, for want of which it will be stinted in its growth, and often remain for twenty years together without making any progress; it is brought forward much sooner, when sheltered by other plants.

An improved method of planting this tree for hurdles, hoops, laths, fencing, and what is termed post and billet for collieries, is described by a correspondent in the fifth volume of the Papers published by the Bath Society.

The leaves of the ash appear late and fall early, it is therefore unfit to be planted for protection or ornament. Its timber ranks next in value to the oak; and it ought, when sold, to be measured to a much smaller girth than either oak or elm.

The wood of ash possesses the uncommon property of being almost uniformly good, whether of young or old trees. It is hard, tough, and much used in making the different implements of husbandry, but particularly for hop-poles. Its ashes afford very good potash; and the bark is employed in tanning calf-skins. The seeds are acrid and bitter, and the leaves have been used for the adulteration of *tea*. Poor people formerly derived considerable advantage by collecting them; but we understand this practice has been prohibited, as it tends to diminish the revenue. We may, however, venture to say, that the leaves of the ash are as wholesome as those of the tea-tree: the latter, like most other evergreens, is of a doubtful, if not pernicious, quality, independently of the circumstance, that our teas may also partake of the fraudulent practice of the Chinese, to which most of their goods are liable.

In rural economy, it has been asserted, that the leaves of the ash impart a bad taste to milk; and it is, therefore, seldom suffered to grow in dairy farms. Those leaves, however, are eaten with avidity by horses, sheep, and goats, for which animals they are considered as good fodder.

The bark of the common ash is used in dyeing. It is placed for some time in water, with a solution of vitriol, by which the water acquires a black colour. The Morlachians boil the bark for the space of eight days, with the dross of iron, and, when the solution has grown cold, they use it for dyeing black. With *cold* water, the bark makes a lixivium of a variegated colour, which displays azure and greenish shades; but *boiled* water is not proper, as it renders the dye thick and brown. *Warm* water is preferable, as this produces a blueish lixivium, which imparts a fine blue colour to yarn, particularly if it has been previously dyed yellow. According to Dambourney, the fresh shavings of ash, give to wool, prepared with bismuth, the true and permanent *vigogne* colour.

Several species of this highly useful tree, grow in the United States.

1. *Fraxinus Americana Carolina*, or red ash; grows to the height of 30 feet, dividing into several branches, the

small ones generally opposite; leaves composed of three or four pair of lobes, terminated by an odd one, of a light green colour, egg-shaped and pointed. Their under surface covered with white downy hairs.

2. *Fraxinus alba*, or white ash;

3. *Fraxinus nigra*, or black ash; grows in moist places, covered with rough, light coloured bark, and sending out but few branches.

4 *Fraxinus Pennsylvanica*, or Pennsylvania sharp-keyed ash.

The ash is a large tree: the second and last species are much used by wheelwrights and carriage makers, for shafts, rimmers, wheels, axles, &c. not being apt to split. It is excellent for tenons and mortises. In England, the ash is felled from November to February: if it be done either too early in autumn or too late in spring, the timber will be subject to be infested with worms and other insects. Is there any difference observed as to the durability of the ash when felled in different seasons, in the United States? An answer is required. The ash is greatly cultivated in England, being easily propagated. Many hundred acres have been planted by individuals, within a few years past. The prickly ash is a tree of a different genus. See ARALIA SPINOSA.

ASHES, generally speaking, are the remains of bodies reduced by fire.

There is a great variety of *wood-ashes* prepared from different vegetables. We have already described the properties of ALKALIES, (p. 34,) and shall at present observe, that vegetable ashes contain a great quantity of *fixed salt*, blended with earthy particles; and that from these ashes are extracted the fixed alkaline salts, called POT-ASH, PEARL-ASH, BARILLA, &c. of the preparation, and properties of which we propose to treat under their respective heads.

Leached ashes are much used, in some parts of the United States, as a manure. Great quantities are annually taken from the city of Philadelphia to Long Island, for the purpose. They cost here 40 cents per one horse cart-load, and commonly bring one dollar 50 cents when delivered. From a paper in the first volume of the *New York Agric. Soc. Trans.* by Mons. E L'HOMMEDIEU, it appears, that ashes are found to succeed best on dry loamy lands, or loam mixed with sand. It is considered as the cheapest manure that can be procured. Ten loads of this manure, on poor land, will produce ordinarily twenty-five bushels of wheat. which exceeds, by five dollars, the expense of the manure; and the five dollars pays for the expense of labour in raising the crop. The land is then left in a state for yielding a crop of hay of between two and a half tons per acre, which it will continue to do for a great number of years. No manure continues so long in the ground as ashes.

[In New York state, the back country farmers pay all the expense of clearing their land by the ashes of the wood burnt on it. One bushel of field ashes of oak, is worth 12½ cents. Of hickory 18 cents. One bushel of house (hearth ashes,) of oak is worth 18 cents: of hickory 25 cents at this day, (1819.) A bushel of good oak ashes yields about 4lbs. of potash, of hickory ashes about 6lbs.

It is surprising all new planters do not pursue the same economical plan. The ashes are mixed with one fourth of *good* lime; and leached. The ley is evaporated into potash in large cast iron boilers.—T. C.]

ASPARAGUS, also called Sparagus, Sperage, or Sparrow-grass, is an esculent plant, which is reared with great attention, and much esteemed on account of its delicate flavour. There are ten species, but one only is cultivated for the table, viz. the common asparagus, which has an erect herbaceous stalk, and bristly leaves; the other species are sometimes kept in the gardens of the curious, but more for the sake of variety, than on account of their utility.

This useful plant is best propagated from the seeds, and its successful culture almost entirely depends on the proper quality of such seed. Hence, some of the most promising buds should be marked with a stick, and when the seed begins to ripen, and the stalks to wither, they ought to be cut; and, the berries being rubbed off into a tub or other vessel, water should be poured upon them. After they have been stirred, the seeds will subside, and the floating husks may be poured off with the water. The seeds must then be spread to dry, and thinly sown, in the beginning of February, on a bed of rich earth. They should be trod into the ground, and the earth raked over them. During summer, the bed should be kept clean of weeds, and about October, when the stalks appear withered, a small quantity of rotten dung should be spread over the bed, about half an

inch in thickness. In the following spring, the plants will be in a proper state for transplanting, when the ground should be prepared for them, by trenching it, and disposing a large quantity of rotten dung in the trenches, so that it may lie at least six inches below the surface; after which, the whole plot must be levelled, and all the loose stones carefully picked out. The most eligible situation for such hot-beds, is a south-western aspect, sheltered from the north; and the soil should be neither too moist, nor too firm, or hard. If the season be forward, and the soil dry, the asparagus should be transplanted in the beginning of March: but, in a wet soil, it is preferable to wait till the beginning of April, at which time the plants begin to shoot. The roots should, at this season, be carefully raised with a narrow-pronged dung-fork, shaking from them the adhering earth, separating them from each other, and laying their heads even, for the greater convenience in planting them; which should be performed in the following manner: Lines are drawn across the bed, at a distance of one foot from each other, after which they must be dug in the form of small trenches of six inches in depth, into which the roots must be laid, with their buds upwards, so that, when the earth is raked over them, they may be two inches under the surface. A space of two feet and a half should be left between every four rows, for the purpose of affording room to cut the stalks. In October, the shoots of the asparagus should be cut within two inches of the ground; but, with respect to this process, the following circumstance deserves attention: as often as a stalk is cut, a new one springs up, and every plant running to seed deposits a new bud or eye, as it is called by gardeners, beside the new shoots, which sprout the following spring. Hence, the cutting ought not to be too long continued, as this practice would prevent the new shoots from sprouting, and deprive those which are in bud, from acquiring sufficient strength.

In Pennsylvania and New Jersey, the cutting must not be continued longer than the first of June.

Young asparagus, fit for table, may be cut the second spring after planting; but, as this vegetable is with many a desideratum, the following directions, properly attended to, will enable them to produce it at any time during the winter: Take some good roots of one year's growth, and plant them in a rich, moist soil, about eight inches asunder; the second and third years after planting, they will be fit for removal to a hot-bed, which should be made rather of heating materials, especially tanner's waste and horse-dung, about three feet thick, and covered with a stratum of earth, six inches high. The plants should then be laid against a ridge made at one end, without trimming or cutting the fibres; between every row, make a small ridge of fine earth, and thus proceed until the whole is planted; next, let the bed be covered to the thickness of about two inches with earth, and encompassed with a straw-band. About a week after, the whole should be sheltered under frames and glasses, and three inches of additional earth laid on the beds; the proper season for constructing which, is from November to March.

Dr Darwin advises the loosening, or turning over the earth, around and above the roots of this plant annually for the purpose of admitting air into its cells or cavities, to convert a part of the manure, or carbonaceous soil, with which they have been supplied, into ammonia, or into carbonic acid, and thus to afford them both warmth and nutriment.

The roots of this plant have a slightly bitter, mucilaginous taste, rather inclining to sweetness; the fruit is nearly of a similar flavour; but the young shoots are the most agreeable to the palate.

In the 13th vol. of the "*Repertory of Arts*," &c. a new method of rendering asparagus more productive, is communicated by Mr. Richard Weston; who observes, that the male plants yield a greater number of shoots than the female ones; though the former are of an inferior size. He consequently advises *males only* to be selected for the formation of beds; and, to prevent mistakes, they should not be planted from the seed-bed, till they have flowered. After having grown 12 months, Mr W. directs them to be removed into beds, at the distance of six inches from each other, where they ought to remain another year, in which they generally flower; a small stick must then be driven into the ground, contiguous to each of the male plants, in order to separate them from the females, the latter of which are then to be pulled.

Towards the end of July, especially if the weather be wet, the stalks of the asparagus should be cut down, the

beds be *forked up*, and raked smooth. In case the season be dry, Mr. Weston irrigates the beds with the draining of a dung-hill; leaving them somewhat hollow in the centre for the better retention of the water or rain. In the course of 12 or 14 days, the asparagus begins to appear; and, if the weather be very dry, the watering ought to be repeated once or twice, every week. By such method, he observes, a constant supply of this vegetable may be obtained, till the month of September, when hot-beds will become necessary; so that by making five or six of the latter during the winter, a regular succession may be procured, throughout the year.

Mr. J. Cooper of New-Jersey, who raises the finest asparagus brought to Philadelphia market, sows his seeds in drills; the beds are so far distant from each other, that the centre may be reached by a workman standing in the alley between them. He permits the plants to stand in the beds two years, and then places them in trenches ten inches deep, and three feet apart: the plants are one foot from each other. The first year the trench is only half filled with loose rich earth, the second year, it is filled up and covered with manure. Mr. Cooper's soil is sandy. According to the same gentleman, this vegetable will continue for ten years; it will then gradually decline in flavour, but the plants will remain for twenty years, and overgrow all the ground.

Asparagus is allowed to promote the appetite; and affords a delicious article of nourishment to the invalid and valetudinarian, who is not troubled with flatulency.

As a substitute for asparagus, the young buds of hops have been recommended, as they may be more easily procured, and are both grateful and wholesome.

Aspen-Tree. See Poplar.

ASS, by naturalists, is classed as a species of horse, or *Equus*.

The tame or domestic Ass, is an animal remarkable for his meekness, patience, and tranquillity. He submits with firmness to chastisement, is temperate in his food, and contents himself with the disagreeable herbage which other animals disdain to eat; but is more delicate with regard to his drink, never using water, unless it be perfectly pure. This animal is esteemed for his attachment; and, though generally used with severity and harshness, nay, often with cruelty, he is fond of his master, has a scent of him at a distance, and easily distinguishes him from other persons. Of all animals, the ass, perhaps, is capable of supporting the heaviest burden, in proportion to his size: and, on account of his slow and regular pace, is particularly useful in journeying over uneven grounds, and mountainous and hot countries.

The finest breed of asses was formerly met with in Egypt, but, at present, those reared in Spain are preferable. In the latter country, as well as in Italy, the inhabitants eat the flesh of asses with avidity. Their milk is of so thin a consistence, that it neither affords butter nor cheese, but is extremely agreeable to the tender stomachs of consumptive persons, and very wholesome for young children, when drank while warm from the animal; but it should be taken at least three or four times a day, half a pint at each time, and continued for several weeks or months, if any real benefit be expected from this simple diet.

ASSIMILATION, in animal economy, is that hidden natural process by which living beings are enabled to convert such bodies as have a certain affinity to them, or at least after having undergone some preparation and change of their properties, into their own substance and nature. Hence every culinary process is conducted on chemical principles analogous to those on which the digestion of food appears to depend in the human stomach. See Chyle, Digestion, Nutrition, Saliva.

ASSOCIATION of *Ideas*, is where two or more ideas constantly and immediately follow one another in the mind, so that one shall almost infallibly produce the other, whether there be any natural relation between them or not. According to Dr. Hartley, particular sensations result from previous vibrations conveyed through the nerves to the medullary substance of the brain, and these are so intimately associated together, that any one of them, when impressed alone, shall be able to excite in the mind the ideas of all the rest. This author maintains that simple ideas run into complex ones by association.

Assurance. See Insurance.

ASTHMA, is a spasmodic disease of the organs of respiration, attended with cough, difficulty of breathing, wheezing, &c.

There are two distinct species of this disorder, each of which requires a differ-

-ent treatment: 1. When it is attended with an accumulation and discharge of humours from the lungs, in which case it is called [illegible] *asthma*; and 2. When the patient is not troubled with coughing, or at least has no expectoration, which is termed *dry asthma*. Yet these complaints seldom affect persons in early life, and then chiefly the male sex.

Asthma, in general, is distinguished by paroxysms, preceded by a sense of tightness in the chest, and in general, occurs during the night. The patient cannot lie in an horizontal posture, without danger of suffocation; and, when seized, is immediately obliged to sit upright. After continuing for several hours in this state, he becomes easier; his breathing is less difficult and oppressed, the cough not so frequent, and an expectoration of mucus taking place, the paroxysm abates until the next night; but the symptoms continue in a greater or less degree during the day, according to the particular state of the atmosphere, and other circumstances. The attack is sometimes induced by external heat, at others by cold; but in either case, their *sudden* accession will sufficiently distinguish the asthma from symptomatic shortness of breath. There is a greater probability of curing it in youth, than at an advanced age. But, in the former case, it is often succeeded by a confirmed pulmonary consumption; and, after a long continuation, generally terminates, either in dropsy of the breast, or an aneurism of the heart or arterial system. A tremulous respiration, paralysms of the arms, and a diminution of the urinary secretion, are unfavourable symptoms.

This is one of the chronic diseases, which may continue for a considerable number of years. Sir John Floyer, when he published his celebrated treatise on this subject, had suffered under repeated paroxysms for almost thirty years. The usual treatment is, to bleed, during a fit, unless extreme weakness or old age should forbid the use of the lancet; to inject a purging clyster, containing a solution of asafœtida; and if the violence of the symptoms do not speedily abate, to apply a blistering plaster to the neck or breast. Previously to a fit, emetics have been found useful, especially when the stomach was loaded with crudities. In the intervals, *lac ammoniacum*, vinegar of squills, asafœtida pills, and other stimulating and deobstruent medicines, are usefully employed. Sir John declares, that a strong infusion of roasted coffee is the best remedy he ever experienced, to abate the paroxysms. The coffee must be of the best Moco, newly burnt, and made very strong, immediately after grinding. He orders an ounce to one dish, which is to be repeated after the short interval of a quarter or half an hour, and taken without milk or sugar. By the use of this remedy, he lived many years tolerably easy, under his asthmatic complaint. Dr. Percival also asserts, that he has employed it with great success.

In a violent paroxysm of asthma, from the effects of which there is imminent danger of suffocation, the administration of an emetic is sometimes advisable, as vomiting tends to produce immediate relief. This remedy, however, can only be resorted to with safety, under the following circumstances. 1. That there be no symptoms of inflammation discoverable; 2 That the humid matter in the pectoral organs be loose, and ready for expectoration; which may be ascertained by a free rattling of the throat; 3 When respiration itself is not extremely impeded: and 4. When the patient's strength is not too much exhausted.

On these conditions, an emetic may prove the only means of saving his life; though it may also accelerate the fatal catastrophe, especially if the breast be clogged with matter, and the patient possess not vigour and breath sufficient to support the operation of an emetic. Hence a judicious practitioner will, in such cases, not hesitate to direct a brisk dose, in order most speedily to produce the desired effect, and to save the constitution from being unnecessarily exhausted. But this illustration also evinces the importance of every step in the practice of physic; and that neither officious friends, nor mercenary pretenders, are the most proper persons, whose services can be useful on such or similar occasions. We, therefore, think it our duty to corroborate this proposition still farther, by exhibiting a concise view of those causes, from which that formidable disease may arise in different individuals. The principal of these are as follows:

1 Collections or congestions of blood in the lungs, from which there may not only arise the dry asthma, but likewise the Suffocative Catarrh, which is, strictly, an acute disease, occasioned by an extravasation or effusion of

blood into the cellular substance of the lungs, and of which we propose to treat in its proper place.

2. Spasms in hypochondriacal and hysteric persons; which often lay the foundation of a dry, convulsive asthma.

3. Worms in the first passages.

4. Stones in the gall bladder; aneurisms; *polypi*, or concretions of grumous blood in the large vessels.

5. Asthma may likewise be a symptom of dropsy of the chest.

6 Scrophulous, rheumatic, gouty, psoric, and scorbutic acrimony—all may occasion the asthma, either in the lungs themselves, or by consent of parts

7. Noxious vapours arising from the decomposition of lead, or arsenic; which generally cause a convulsive asthma.

8. The introduction of dust into the lungs, to which millers, masons, hatters, &c. are subject.

9. Tubercles in the lungs, from which arises the dry asthma.

10. The abuse of ardent spirits.

11. A weak digestion, attended with great flatulency.

12 Every thing that oppresses the vessels, such as an expansion of the uterus, obesity or preternatural fatness, aneurisms, fleshy and other tumours in the chest, a distended abdomen by dropsy, obstipations, &c.

13. General debility, by which respiration is frequently rendered difficult, without any other particular cause. This affection may be ascertained from the circumstance, when the patient ascends a number of steps with greater facility than he is able to descend, because the latter requires a greater degree of muscular effort than the former.

The exercise of riding on horseback is useful. Changes of weather are very sensibly felt by asthmatic persons, who, in general, cannot live with any comfort in the atmosphere of large cities, though some are to be found, who feel themselves better in an air replete with gross effluvia; and breathe with greater ease, in a crowded room, where there is a fire and candles. A principal advantage, however, will be derived in this obstinate disorder, from a light and *frugal diet*, consisting of little animal food, such as may be easily digested, and at the same time, avoiding all flatulent and heating substances, as well as liquors; for instance, wine, milk, turnips, cabbages, &c. not exposing the body to the influence of hot air, strong smells, offensive vapours, and the like.

ASTRONOMY is considered as the most sublime of all the sciences, and implies a knowledge of the heavenly bodies, with regard to their respective magnitude, motions, distances, &c.; and of the natural causes by which these phenomena are produced It is not improbable, that ADAM and his immediate progeny, the antediluvians, possessed a slight knowledge of astronomy. On the building of the tower Babel, NOAH is supposed to have retired with his children, born after the flood, to the north-eastern part of Asia, where his descendants peopled the vast empire of China; and this, in the opinion of Dr LONG, accounts for the early cultivation of astronomy by the Chinese Mr BAILLY, who has taken great pains to investigate the progress of the Indians, is of opinion, that the first epoch of their astronomy commences with the conjunction of the sun and moon, which took place 3102 years before the Christian æra, [at the Hindu æra of the Kali Yug See Crawford's Account of the Hindoos.—T C] Even the Americans, and especially the Mexicans, were not altogether destitute of astronomical knowledge. But the Chaldeans and Egyptians, were the first nations that became, in this respect, conspicuous in ancient history; and it is doubtful, whether the Phœnicians acquired the rudiments of this science from the former, or the latter: though we are indebted to their enterprising merchants, who first applied it to the useful and important purposes of navigation.

Among the Arabs, who adopted the present arithmetical characters from the Indians, GEBER laid the foundation for our modern trigonometry; which MENELAUS, the Greek, about the year 90 after Christ, had ineffectually attempted to establish, in his three excellent books on spherics, even after that doctrine had been rendered more simple by the labours and improvements of PTOLEMY

The Emperor FREDERIC II. of Germany, who was a great patron of the sciences, in 1230, also revived the study of astronomy in Europe Thence arose JOHN HALIFAX, CLAVIUS, ROGER BACON, and at length the justly celebrated NICOLAUS COPERNICUS, the greatest luminary that ever appeared on the shores of the Baltic, and who is undoubtedly the principal reformer of astronomical science. After having studied physic at Rome, and returned to his native country, at present called

West Prussia, he began in the year 1507, to doubt the accuracy of all other systems except that of PYTHAGORAS. Endowed ... a comprehensive and penetrating mind, a correct judgment, and inexhaustible powers of application, he could not fail to discover the truth of the hypothesis advanced by that sagacious Greek, "who placed the sun in the centre, and supposed all the planetary bodies, and the earth itself, to revolve around him."

Since that period, astronomy has been progressively cultivated by different nations. The principal characters, whose names will be transmitted to posterity, for their useful labours in the immense field of practical and theoretical astronomy, are nearly the following: TYCHO-BRAHE, the Portuguese who spent a great part of his time in useless efforts of opposing the immutable system of COPERNICUS; CLAIRULT, D'ALEMBERT, LA CAILLE, and DE LALANDE, in France; GALILEO, CASSINI, FONTANA, BOSCOVICH, BIANCHINI, and others in Italy; KEPLER, the two EULERS, MEYER, KÆSTNER, BODE, and more especially V ZACH, the leader of German astronomers, who now resides at the new observatory, near Gotha; and NAPIER, NEWTON, FLAMSTEAD, HALLEY, HUYGENS, HOOK, BRADLEY, FERGUSON, GREGORY, MASKELYNE, and in a more eminent degree than any of his compatriots on the continent, the transcendent HERSCHEL. [The greatest astronomer since, NEWTON, is undoubtedly LE PLACE, and his Mecanique Celeste, the most profound treatise on the subject, extant —T C.]

ATMOSPHERE, a term derived from the Greek words *vapour* and *sphere*, whence it has been generally applied, to signify that surrounding mass of air which consists of aqueous and other vapours, the electric and magnetic fluids, &c but the altitude or extent of which has never been accurately ascertained.

The atmosphere is not a simple, but a compound body. Pure air, or *oxygen*, is but a small part of its composition, while that of *azote*, or *nitrogen*, constitutes about four fifths. The former is, on account of its more salutary properties, better adapted to the respiration of men and animals, than common atmospheric air; and though, by its powerful influence, it is eminently calculated to restore the life of creatures when animation is accidentally suspended, so that the late Dr INGENHOUZ has justly termed it *vital air*; yet it is not proper for long-continued respiration. Azote, or suffocative air, on the contrary, as well as carbonic acid gas, which constitutes about one part in a hundred of the atmosphere, are unfit for supporting animal life, being absolutely irrespirable. Hence it must be obvious, that a greater or less proportion of this noxious ingredient in our atmosphere, arises from the innumerable processes of combustion, putrefaction, and respiration, whether by nature or art, in all large and populous cities. For this reason, *country-air* is so much preferable, that certain invalids, especially phthisical, and asthmatic persons, are obliged to retire from towns to a less vitiated region.

It is now found that the atmosphere, in all places exposed to the influence of the winds, contains very nearly the same proportions of oxygen and nitrogen; a circumstance of great importance; for by teaching us that the different degrees of salubrity of air, do not depend upon differences in the quantities of its principal constituent parts, it ought to induce us to institute researches concerning the different substances capable of being dissolved or suspended in air, which are noxious to the human constitution; particularly as an accurate knowledge of their nature and properties would probably enable us, in a great measure, to guard against or destroy their baneful effects.

ATMOSPHERE is that invisible elastic fluid which surrounds the earth to an unknown height; and encloses it on all sides. This fluid is essential to the existence of all animal and vegetable life, and even to the constitution of all kinds of matter whatever, without which they would not be what they are: for by it we literally may be said to live, move, and have our being: by insinuating itself into all the pores of bodies, it becomes the great spring of almost all the mutations to which the chemist and philosopher are witnesses in the changes of bodies. Without the atmosphere no animal could exist; vegetation would cease, and there would be neither rain nor refreshing dews to moisten the face of the ground: and though the sun and stars might be seen as bright specks, yet there would be little enjoyment of light, could we ourselves exist without it. Nature indeed, and the constitutions and principles of matter would be totally changed if this fluid were wanting.

The mechanical force of the atmosphere is of great importance in the

affairs of men, who employ it in the motion of their ships, in turning their mills, and in a thousand other ways connected with the arts of life.

With regard to the weight and pressure of the atmosphere, it is evident that the whole mass, in common with all other matter, must be endowed with weight and pressure: and it is found by undeniable experiments, that the pressure of the atmosphere sustains a column of quicksilver in the tube of a barometer of about 30 inches in height; it accordingly follows, that the whole pressure of the atmosphere is equal to the weight of a column of quicksilver of an equal base, and 30 inches in height, or the weight of the atmosphere on every square inch of surface is equal to 15 pounds. It has moreover been found, that the pressure of the atmosphere balances in the case of pumps, &c. a column of water 34½ feet high; and the cubical foot of water weighing just 1000 ounces, or 62½ lbs., 34½ multiplied by 62½, or 2,158 lbs. will be the weight of a column of water, or of the atmosphere on the base of a square foot; and consequently the 144th part of this, or 15 lbs. is the weight of the atmosphere on a square inch. From these data, Mr. Cotes computed the pressure of the atmosphere on the whole surface of the earth to be equivalent to that of a globe of lead 60 miles in diameter. Dr. Vince and others have given the weight at 77,670,297,973.563,429 tons. This weight is however variable; it sometimes being much greater than at others. If the surface of a man, for instance, be equal to 14½ square feet, the pressure upon him, when the atmosphere is in its lightest state, is equal to 13½ tons, and when in the heaviest, it is about 14 tons and one third; the difference of which is about 2,464 lbs. It is surprising that such weights should be able to be borne without crushing the human frame: this indeed would be the case, if all the parts of our body were not endowed with some elastic spring, whether of air or other fluid, sufficient to counterbalance the weight of the atmosphere. Whatever this spring is, it is certain that it is just able to counteract the weight of the atmosphere, and no more; of course it must alter in its force as the density of the atmosphere varies: for if any considerable pressure be superadded to that of the air, as by going into deep water, it is always severely felt; and if on the other hand, the pressure of the atmosphere be taken off from any part of the human body, by means of the apparatus belonging to the air-pump, the inconvenience is immediately perceived.

The difference in the weight of the atmosphere is very considerable, as has been observed, from the natural changes in the state of the air. These changes take place chiefly in countries at a distance from the equator. In Great Britain, for instance, the barometer varies from 28·4 to 30·7. On the increase of this natural weight, the weather is commonly clear and fine, and we feel ourselves alert and active; but when the weight of the air diminishes, the weather is often bad, and we feel listlessness and inactivity. Hence invalids suffer in their health from very sudden changes in the atmosphere. In our observations on the barometer, we have known the mercury to vary a full inch, or even something more, in the course of a few hours. Such changes, however, are by no means frequent. Ascending to the tops of mountains, where the pressure of the air is very much diminished, the inconvenience is rarely felt, on account of the gradual change: but when a person ascends in a balloon with great rapidity, he feels, we are told by Garnerin and other aeronauts, a difficulty of breathing, and many unpleasant sensations. So also, on the condensation of the air we feel little or no alteration in ourselves, except when the variations are sudden in the state of the atmosphere, or by those who descend to great depths in a diving-bell. See Diving-bell.

Various attempts have been made to ascertain the height to which the atmosphere is extended all round the the earth. These commenced soon after it was discovered by means of the Torricellian tube, that air is endued with weight and pressure. And had not the air an elastic power, but were it every where of the same density, from the surface of the earth to the extreme limit of the atmosphere, like water, which is equally dense at all depths, it would be a very easy matter to determine its height from its density and the column of mercury which it would counterbalance in the barometer tube: for, it having been observed that the weight of the atmosphere is equivalent to a column of 30 inches or 2½ feet of quicksilver, and the density of the former to that of the latter, as 1 to 11040; therefore the height of the uniform atmosphere would be 11040 times 2½ feet,

that is 27,600 feet, or little more than 5 miles and a quarter. But the air by its elastic quality, expands and contracts; and it being found by repeated experiments in most nations of Europe, that the spaces it occupies, when compressed by different weights, are reciprocally proportional to those weights themselves; or that the more the air is pressed, so much the less space it takes up; it follows that the air in the upper regions of the atmosphere must grow continually more and more rare, as it ascends higher; and indeed that, according to that law, it must necessarily be extended to an indefinite height. Now, if we suppose the height of the whole divided into innumerable equal parts, the quantity of each part will be as its density; and the weight of the whole incumbent atmosphere being also as its density; it follows, that the weight of the incumbent air is every where as the quantity contained in the subjacent part; which causes a difference between the weights of each contiguous part of air.

The atmosphere, or air, has also a reflective power; and this power is the means by which objects are enlightened so uniformly on all sides. The want of this power would occasion a strange alteration in the appearance of things; the shadows of which would be so very dark, and their sides enlightened by the sun so very bright, that probably we could see no more of them than their bright halves; so that for a view of the other halves, we must turn them half round, or if immoveable, must wait till the sun could come round upon them. Such a pellucid unreflective atmosphere would indeed have been very commodious for astronomical observations on the course of the sun and planets among the fixed stars, visible by day as well as by night; but then such a sudden trasition from darkness to light, and from light to darkness, immediately upon the rising and setting of the sun, without any twilight, and even upon turning to and from the sun at noon day, would have been very inconvenient and offensive to our eyes. However, though the atmosphere is greatly assistant in the illumination of objects, yet it must also be observed that it stops a great deal of light.

[ATOM, in *Atomical Philosophy* An atom is a particle of matter indivisible, undecomposable, and is synonimous with molecule.

Atomical philosophy, is that system which teaches that all compound bodies are formed by the union of 1 atom to 1 atom, or to 2 atoms, or to 3 atoms, or to 4 atoms, &c. As these atoms have different weights, the numbers expressive of their weights, will be multiples and aliquot parts of each other. Thus suppose a body composed of 1 atom a, united to 3 atoms xxx, forming the body $axxx$. And that a weighs 4 and x weighs 6. Then the weight of the body will be represented by $4 + 18 = 22$ Now if another atom x be added, it will be an aliquot part of 18, and if another atom a be added, it will make 8 become the representative of twice a.—T. C.]

ATROPA, deadly-nightshade, a remarkable species of which, the *Belladonna*, grows wild in Britain. It has a perennial root, which sends out strong herbaceous stalks of a purplish colour, rising to the height of four or five feet, garnished with entire oblong leaves, towards autumn, that changes to a purplish colour. The flowers are large, and come out singly between the leaves, upon long footstalks, bell-shaped, and of a dusky colour on the outside, but purplish within. After the flower is past, the germen becomes a large round berry, a little flatted at the top. It is first green; but, when ripe, turns to a shining black, sits close upon the empalement, and contains a purple juice of a nauseous sweet taste, and full of small kidney-shaped seeds. This particular description may be acceptable in the present publication, because there have been many instances, it is said, of children killed by eating berries of a fine black colour, and about the size of a small cherry, which are no other than those of the *Belladonna*; and it is asserted, that if an accident of this kind be discovered in time, a glass of warm vinegar will prevent the bad effects.

ATROPHY, in medicine, a disease wherein the body, or some portion of it, does not receive the necessary nutriment, but wastes and decays incessantly.

ATTRACTION, in natural philosophy, the primary law of matter, in obedience to which, atom unites to atom, and body to body; and by which all created things are prevented from separating, as a handful of dust cast into the air, When a ball is discharged from a cannon, the force by which it is propelled overcomes for a time the power by which it is attracted to the earth; but no sooner has the resistance of the air diminished this force, than it

descends with a swiftness proportioned to its weight; that is, to the power with which it overcomes the resistance of the air; but for which, when the propulsion ceased, it would remain afloat, like the down of thistles. That which in common language is called weight, is by philosophers explained to be gravitation, that is, a tendency to the centre of gravity. If a little water, or any other liquid, is dropped on a table, and a piece of loaf sugar placed upon it, the fluid will ascend, or, ordinarily speaking, be sucked up into the pores of the sugar; that is, the one is attracted by the other. If pieces are pared off two leaden bullets, the surfaces of the parts that are cut being made perfectly smooth, and the two bullets pressed together, they will be found to adhere strongly; that is, they mutually attract each other. If a smooth piece of sealing-wax or amber be rubbed on any woollen body till it be warm, it is well known that it will attract light bodies that are brought within the distance of half an inch or an inch. The attraction of iron by the power of the magnet is familiar to every one. There remains to be mentioned another effect of attraction: if to a phial of water, in which bruised galls have been infused, and which is colourless, be added the contents of another phial, containing a solution of copperas or green vitriol, also colourless, the mixture becomes immediately black: if to this, aquafortis (or the nitrous acid, as it is called by chemists), be added, the clearness of the liquor is restored, nothing of its former state being perceived, except a little sediment at the bottom; and, by a farther addition of salt of wormwood in a fluid state, which is an alkali, the black complexion is resumed. These phenomena are explained upon the principle of attraction. The iron which the salt of vitriol contains, has a strong attraction for the galls, and on its union with it, the mixture becomes black; but when the nitrous acid is introduced, the iron, which has a still stronger attraction for this than for the gall, joins with it; and, the galls separated from it, the liquid is again clear. On the admission of the alkali, the nitrous acid, which has a stronger attraction for this than for the iron, drops the latter; and this re-uniting with the galls, the black colour is restored.

The several kinds of attraction are arranged under five distinct heads. 1. That of the cannon ball falling to the ground, the attraction of gravity or gravitation. 2. That of the two leaden bullets adhering together, and of water ascending into the pores of the sugar, is called the attraction of cohesion, and also capillary attraction, from the experiment having been made with small tubes in which water will rise to a considerable height. 3. Electric attraction, because the sealing-wax, when warmed by friction, is in an electrified or excited state. 4. Magnetic attraction. 5. Chemical attraction, or the attraction of combination; so called because upon it many of the processes in chemistry depend; and because by this means most of the combinations which we observe in salts, the ores of metals, and other mineral bodies, are effected. [6. Attraction of crystallisation. 7. Optical attraction, and polarity of light. 8. Attraction of organic assimilation.—T. C.]

AUCTION, a public sale for the disposal of household goods, books, plate, landed estates, &c. By this method of sale, the highest bidder is always the purchaser. The origin of sales by auction is very ancient; for among the Romans it was performed by the public crier *sub hasta*; i. e. under a spear erected on that occasion; and the goods purchased, were delivered by a magistrate.

AUGUST, the eighth month of our year, containing 31 days. August was dedicated to the honour of Augustus Cæsar, because in the same month, before called Sextilis, or the sixth from March, he was created consul, thrice triumphed in Rome, subjugated Egypt to the Roman sway, and put an end to the civil wars.

AURICLE, that part of the ear which is prominent from the head.

AURICLES *of the Heart*, are appendages of the heart at its base, distinguished by the names right and left, and they are intended as diverticula for the blood, during the contraction of the heart. In other words the auricle is a reservoir, holding the blood, till the ventricle has emptied itself by its contraction.

AURORA, the morning twilight, or that faint light which appears in the morning when the sun is within eighteen degrees of the horizon.

AURORA-BOREALIS, northern irradiance, northern lights or streamers, a meteor appearing in the northern part of the heavens. It is most frequent and most brilliant during the winter solstice. In the Shetland islands, the

merry dancers, as they are there called, are the constant attendants of clear evenings, and cheerers of the long winter nights. In still more northern countries, as Norway, Lapland, and Siberia, they greatly enliven the snowy landscapes. They commonly appear at twilight, near the horizon, of a dun colour, approching to yellow; sometimes continuing in that state for several hours, without any sensible motion; after which they break out into streams of stronger light, spreading into columns, and altering slowly into a thousand different shapes, varying their colours from all the tints of yellow to the obscurest russet. They often cover the whole hemisphere, and then make the most splendid appearance. Their motions, at all these times, are amazingly quick; and they astonish the spectator with the rapid change of their form. They break out in places where none were seen before, skimming briskly along the heavens, and are suddenly extinguished, leaving behind them a uniform dusky track. This is again illumined in the same manner, and as suddenly left a dull blank. In certain nights, they assume the appearance of vast columns, on one side of the deepest yellow, on the other declining away till it becomes undistinguished from the sky. They have generally a strong tremulous motion from the end, which continues till the whole vanishes. In a word, we, who only see the extremities of this northern phenomenon, have but a faint idea of their grandeur or their motions. According to the state of the atmosphere, they differ in colour: they often put on that of blood, and make an awful appearance. It need not be added, that these are among the occurrences of nature at which the ignorant tremble.

With regard to the cause of the aurora borealis many conjectures have been formed. 1. The first which naturally occurred was, that it resulted from the ascent of inflammable sulphureous vapours from the earth. 2. Dr. Halley, who was unacquainted with the electric power, supposed that this earth was hollow, having within it a magnetical sphere corresponding in virtue with all the natural and artificial magnets on the surface, and that the magnetic effluvia, passing through the earth from one pole of the central magnet to the other, might sometimes become visible in their course, and thus exhibit the beautiful coruscations of the aurora-borealis. 3. "Is not the aurora-borealis," says Mr. Canton, "the flashing of electral fire from positive toward negative clouds at a great distance, through the upper part of the atmosphere, where the resistance is least?" 4. Mr. Mairan supposed this phenomenon to proceed from the atmosphere of the sun, particles of which were thrown off by the centrifugal force, acquired by his rotation on his axis; and that these particles falling upon the atmosphere of the earth near its equatorial parts, were from thence propelled by the diurnal motion of the earth towards the polar regions, where they formed the aurora-borealis. 5. M. Bernardin de St. Pierre imagines the atmospherical reflection of the beams of the sun from the ice of the poles, to produce these coruscations. 6. It is now generally thought that this is one of the multiform appearances of the electric fluid; but the precise manner of its operation is by no means settled. From the observations of Mr. Foster in the southern hemisphere, it is received as an established fact, that the course of these flashes is directed from both poles towards the equator. May it be conjectured that the rare state of the atmosphere at the poles, is itself the cause of this phenomenon? or that it is the cause of the visibility of a process which is performed every where? or, to explain why the electricity of those parts of the atmosphere should be constantly found to direct its course from the poles towards the equator, and not from the equator to the poles, may we suppose that it is the return to the equator of the electric fluid drawn during the day to the polar regions? Mr. Dalton says the aurora-borealis is a magnetic phenomenon, the beams being governed by the earth's magnetism.

AUTHENTIC, something of acknowledged authority. As a law term it signifies something clothed in all its formalities, and attested by persons to whom credit has been regularly given. Thus we say authentic papers, authentic instruments. With respect to books there is an obvious difference between authenticity and genuineness. A *genuine* book, is that which was written by the person whose name it bears, as the author of it. An *authentic* book is that which relates matters of fact as they really happened. A book may be genuine without being authentic: and a book may be authentic without being genuine.

AUTOGRAPH, the very hand-writing of any person; or the original of

a treatise or discourse. The word is used in opposition to a copy. Autographa, or original manuscripts of the New Testament, are the copies written by the Apostles, or by amanuenses under their inspection, though even used in this sense the term is not correct. St. Paul seems generally to have adopted the latter mode; but to prevent the circulation of spurious epistles, he wrote the concluding benediction with his own hand.

AUTOMATON, a self-moving machine, so constructed as to be able to perform its office, for a considerable time, as if by its own will. According to this definition, clocks, and various other pieces of mechanism are automata; but the term is generally used for such as, to support the idea of living power, are contrived under the form of an animal, and made to perform animal functions. Four hundred years before Christ, Archytas of Tarentum is said to have made a wooden pigeon which could fly: a report that the experiments of the moderns may justify us in believing. When automata are made to represent mankind, they may be called, for distinction sake, ANDROIDES, under which article, the flute player of M Vaucanson has been mentioned. This gentleman, encouraged by the reception which that admirable piece of mechanism obtained, made a duck which was capable of eating, drinking, and imitating exactly the voice of a natural one. All the actions of a living duck were copied in a really admirable manner; and even the wings, viscera, and bones, were so formed as very strongly to resemble nature In Dr. Hutton's Addenda to his Mathematical Dictionary, is inserted a letter from Thomas Collinson, esq. by which it appears that much of the capacity of the famous chess player, made some years ago by M. Kempbell, was to be attributed to a boy, small of his age, who was concealed under the chess-board. This was an imposture in mechanics; but though the *deception* throws a deserved stigma on the production, the performance was still, perhaps, the *acmé* of the art.

AUTUMN, is computed the third season of the year; and with respect to the animal body, is doubtless the most unhealthy. Hence TERTULLIAN calls it "the test of valetudinarians;" but the ancient Germans, though acquainted with the three other seasons, appear to have been uninfluenced by the severity of autumn; as they had no particular term to express it, unless we admit the word "harvest," in modern German, *Herbst*," as equivalent to what they at present call "*Erndte*," or the gathering in the fruits of the earth.

The circumstances which render this season the least conducive to a healthy state of the body, are the following: 1. Because the vegetable kingdom, with very few exceptions, returns the salubrious leaves of trees and plants to their primitive, maternal earth, where they undergo spontaneous decomposition. This decay, or process of putrefaction, produces a remarkable change in that surrounding medium which supports animal life, and the relative purity of which, determines the most important function of the system, namely, that of respiration. 2 As, by the greater pressure and humidity of the atmosphere, the pores of the skin are so affected, that they become unable to perform their office of exhalation, with the same facility as in winter and summer, it follows that perspirable matter, or at least, its grosser particles, will, in autumn, be liable to remain on the surface, in a state inclining to putrefaction, and to be re-absorbed, to the great detriment of the human or animal body. Hence, arise bilious and putrid fevers, with a long train of other complaints, according to the constitution and particular circumstances of the individual.

Parental Nature, however, has amply provided the means of obviating such disastrous effects. With this intention, she has given us a great variety of sub-acid fruit, and acescent vegetables, which, at that season, attain to their perfection, and are eminently qualified to counteract the putrid disposition of the fluids. To assist her in this benevolent intention, we ought to choose an appropriate diet; and, at the same time, defend the surface of the body with a proper dress, which is warm, light, and sufficiently porous, in order to admit the evaporation of perspirable volatile humours.

Notwithstanding all the objections made by *theorists*, against the use of FLANNEL, worn next the skin, we venture to pronounce it the most beneficial covering; provided the conditions and exceptions we shall state under that article, be duly attended to. But to see the fashionable females of the metropolis, as well as in the country, at all seasons of the year, dressed in muslin, cotton and other light stuffs, scarcely

sufficient to protect them against a sudden blast of wind; such deviations from the rules of prudence, and *real* economy, may, indeed, deserve the lash of the Roman satirist, who speaks of the bitter complaints of PROSERPINE, in chilly autumn, but they cannot be corrected by Reason, till the shrine of that whimsical idol, "Fashion," be shaken, and its ground-work demolished, by a more dignified system of EDUCATION See that article.

AUXILIARY VERBS, in grammar, such as help to form or conjugate others; that is, are prefixed to them; as *to have*, and *to be* In the English language, the auxiliary *am* supplies the want of passive verbs.

AVALANCHES, a name given in Switzerland and Savoy, to wonderful masses of snow that are precipitated, with a noise like thunder, from the mountains, which destroy every thing in their course, and which have sometimes overwhelmed whole villages and their inhabitants in inevitable destruction.

AVE MARIA, the angel's salutation of the Virgin, and used in the Roman ritual as a form of prayer or ejaculation

AVERAGE, in commerce, signifies the accidents and misfortunes which happen to ships and their cargoes, from the time of their loading and sailing to their return and unloading; and is divided into three kinds: 1. The simple or particular average, which consists in the extraordinary expenses incurred for the ship alone, or for the merchandises alone. Such is the loss of anchors, masts and rigging, occasioned by the common accidents at sea; the damages which happen to merchandise by storm, prize, shipwreck, wet, or rotting; all which must be borne and paid by the thing which suffered the damage. 2. The large and common average, being those expenses incurred, and damages sustained for the common good and security both of the merchandises and vessels, consequently to be borne by the ship and cargo, and to be regulated upon the whole. Of this number are the goods or money given for the ransom of the ship and cargo, things thrown overboard for the safety of the ship. The expenses of unlading for entering into a river or harbour, and the provisions and hire of the sailors when the ship is put under an embargo.

AVOIRDUPOIS is the name of the weight adopted for the larger or coarser commodities, such as groceries, hops, cheese, wool, lead, &c. It is distinguished from *Troy-weight*, which was formerly used in England for every purpose, and is still retained for weighing gold, silver, and jewels, for compounding medicines, for experiments on natural philosophy, and for comparing different weights with each other. The former contains sixteen, and the latter only twelve ounces to the pound. Apothecaries purchase their drugs, if wholesale, by the former, but retail them out by the latter. Such bakers as live without the boundaries of corporation towns, are directed to make their bread by avoirdupois weight; those in corporations by troy. The proportion of a pound avoirdupois to a pound troy, is as 17 to 14.

The avoirdupois ounce is less than the troy ounce, in the proportion of 700 to 768, but the avoirdupois pound is greater than the troy pound in the proportion of 700 to 576

for 1lb. avoird. is = 7000 grains troy.
but 1lb. troy is = 5760 grains troy.
also 1oz. avoird is = 437½ grains troy.
and 1oz. troy is = 480 grains troy.

The first statute that directs the use of the avoirdupois weight is that of 24 Henry VIII. which plainly implies it was no legal weight till sanctioned by that statute; the particular use to which the said weight is thus directed, is simply for weighing butcher's meat in the market. After this it gradually grew into general use for weighing such goods as are very coarse and drossy, or subject to waste. See WEIGHTS and MEASURES

AXIOM, from its Greek root, seems to have imported, that the proposition so named was *entirely worthy of credit.* An axiom is a self-evident or incontrovertible truth; as, that a part is less than the whole.

AXIS, in astronomy, an imaginary right line supposed to pass through the earth, sun, planets, satellites, &c. and about which they perform their respective diurnal rotations.

The earth and planets, in their progress through the annual orbit, move in such a manner that the axis of each always keeps parallel to itself, or points to the same parts of the heavens.

The axis of the earth is inclined to the ecliptic, in an angle of nearly 66½°. a position which is well adapted for promoting the fertility of the earth and rendering it habitable.

Axis, in geometry, the straight line in a plane figure, about which it re-

volves, to produce or generate a solid. Thus, if a semicircle be moved round its diameter at rest, it will generate a sphere, whose axis is that diameter. And if a right-angled triangle be turned about its perpendicular at rest, it will describe a cone, whose axis is that perpendicular.

Axis is yet more generally used for a right line conceived to be drawn from the vertex of a figure to the middle of the base.

Axis in Peritrochio, one of the five mechanical powers, consisting of a peritrochium or wheel, and moveable together with it about its axis. The power is applied at the circumference of the wheel, and the weight is raised by a rope that is gathered up on the axis while the machine turns round. See MECHANICS.

AZOT, or AZOTE, which derives its name from the Greek particle *a*, privative, and *zoe*, life, signifying that it takes away life, or more properly, that it does not sustain it, is one of the most abundant elements in nature. In its aeriform state, when it is called *azotic gas* by the French philosophers, it constitutes about three fourths of the air we breathe. When oxygenated, or combined with oxygen, it forms nitrous acid, or aqua-fortis. It composes no inconsiderable part of animal and vegetable bodies, from which it may be drawn by a chemical process; and the quantity of ammoniac, or volatile alkali, which in putrefaction, is emitted by these substances, and which is the chief cause of their fœtid smell when in that state, is formed by a union of the hydrogen and azote which they contain.

The properties of azotic gas are, that it is invisible and elastic, and capable of condensation and expansion. It immediately extinguishes animal life, and the flame of a candle. It has no taste; some plants live and flourish in it. It is not absorbed by water, but is capable of combining with oxygen; and with different proportions of this substance it forms atmospheric air, gaseous oxyde of azote, or nitrous oxyde, nitrous gas, nitrous acid, and nitric acid. It is capable of dissolving sulphur, phosphorus, and charcoal in minute quantities. It unites with hydrogen and constitutes with it ammonia.

AZURE, the blue colour of the sky. Among painters, this word originally signified *lapis-lazuli*, and the blue colour prepared from it. At present, it is called ultramarine: and the blue glass made from the earth of cobalt, and other vitrifiable matters, which, when in masses, is called smalt. is, in the state of fine powder, known by the name of azure. Azure being employed to colour starch, is also called starch-blue.

[The blue colour of the sky, measured by a kyanometer, or painted board, is found to be of a deeper blue as you ascend higher; on Mont Blanc, Saussure found it nearly or quite black.—T. C.]

Azure, in heraldry, the blue colour in the arms of any person below the rank of a baron. In the escutcheon of a nobleman, it is called *sapphire;* and in that of a sovereign prince *Jupiter*. In engraving, this colour is expressed by lines, or strokes, drawn horizontally. This colour may signify justice, perseverance, and vigilance; when compounded with

Or	it signifies	Cheerfulness
Argent		Vigilance
Gules		Readiness
Vert		Enterprise
Purpure		Goodness
Sable		Mournfulness

B.

B is the second letter of the English and most other alphabets. It is the first consonant, and first mute, and its pronunciation is supposed to resemble the bleating of a sheep. B is also one of those letters which are called labial, because the principal organs employed in its pronunciation are the lips. It is pronounced by pressing the whole length of them together, and forcing them open with a strong breath. As a numeral, B was used by the Greeks and Hebrews to denote 2; but among the Romans for 300, and with a dash over it (thus B̄) for 3000.

B, is also used as an abbreviation. Thus B A stands for bachelor of arts; B. L. for bachelor of laws; and B D. for bachelor of divinity.

BABOON, in zoology; a subdivision of the monkey tribe, adopted by Buffon. According to that great naturalist, the apes are those that are totally destitute of tails; the baboons have short tails, and those of the monkeys are long.

BABYLON, the capital of the ancient kingdom of Babylonia or Chaldæa, and supposed to have stood in E lon. 44. 30. N. lat 33 20 Semiramis is said by some, and Belus by others, to have founded this city But by whomsoever it was founded, Nebuchadnezzar was the person who put the last hand to it, and made it one of the wonders of the world.

This capital was, according to Herodotus, (who was himself at Babylon) surrounded with walls, in thickness 87 feet, in height 350 feet, and in compass 480 furlongs, or 60 of our miles It is observed, that those who give the height of these walls but at 50 cubits, speak of them only as they were after the time of Darius Hystaspis, who had caused them to be beaten down to that level These walls formed an exact square, each side of which was 120 furlongs, or 15 miles in length; and were all built of large bricks cemented together with bitumen, which in a short time grows harder than the very brick and stone which it cements.

BAC, in *navigation*, a sort of ferry-boat; in *brewing*, a large kind of tub, wherein the wort is put, to stand and cool before boiling; in *distilling*, a vessel into which the liquor to be fermented is pumped from the cooler, in order to be worked with yeast.

BACCHANALIA, popular, and, as almost all such things will be, somewhat licentious, feasts, celebrated in honour of Bacchus by the ancients. They were *fêtes-champêtres*, and *bals-parées*. Their times of celebration were spring and autumn: the former in the city, and the latter in the fields. The company personified Silenus, Pan, fauns, and satyrs; and learned scandal says, that the characters were fully sustained; but, in their institution, they were scenes of cheerful innocence, and recals of "the old age."

BACCHARIS HALIMIFOLIA, *Cotton Groundsel-tree, Sea Purslane*. This is a sea-side shrub of great beauty in the autumn, when mantled in silky down, white as snow. The bark of the last year's growth of twigs, early in the spring, when the sap begins to flow, expands suddenly, and opens longitudinally, from which springs a limpid juice of the consistence of pure honey, and as sweet and pleasant to the taste. At this season the bees visit these shrubs, and sip the honey entirely, before the sun rises.

BACHELOR, a word of doubtful origin; though, in the political economy of nations, when a plurality of persons apparently glory in that appellation, its practice cannot fail to be attended with effects detrimental to the State, and frequently disgraceful to the individual. We allude to those *unmarried* men, who pretend to live in a state of stoic celibacy, and are, for the most part, generally, either avaricious misers, or unprincipled spendthrifts. That there are many exceptions to this odious character, cannot be denied; yet, in a maritime country, where a great proportion of active men devote themselves to a sea-faring life, there ought

to be public disgrace attached to those who cannot assign the most substantial reasons for their choice of celibacy.

Even the ancient Greeks were so fully persuaded of the pernicious influence of professed bachelors, on the population and morals of their countrymen, that, by the laws of LYCURGUS, they were branded with infamy, excluded from all offices civil and military, as well as from national games and public spectacles. Farther, such persons were compelled to appear at certain festivals, where they were exposed to public derision, and led round the market-place: in this degraded situation, the fair sex conducted them to the altars, and obliged them to make *amende honorable*, by submitting to blows and lashes, at discretion. The women, not satisfied with this specimen of passive obedience, forced them to sing certain songs teeming with satire, and deprecating a state of life which Nature had never designed.

The Roman laws, also, were not more favourable to their toleration; and the vigilant censors frequently imposed arbitrary fines on old bachelors. According to DIONYSIUS, the historian, there existed in Rome an ancient edict by which all persons of full age were *obliged* to marry. But the most remarkable law enacted against them, was that made in the reign of the Emperor AUGUSTUS, by which they were rendered incapable of enjoying the benefit either of legacies or inheritance by will, unless from their near relations. This limitation, PLUTARCH justly observes, induced many bachelors to marry; not so much with the view of having heirs to their own estates, as to qualify themselves to inherit those of others.

Thus it clearly appears that, from the most early ages, the most civilised nations expressed a just abhorrence of a life which is more calculated to promote the narrow grovelling views of the individual, who prefers it to the most sacred and honourable station in society, than to benefit that circle of the community, of which he is frequently a *consuming* and worthless member.

[All these puerile notions are true only in a colony, or perfectly new country All old countries are over populated; human beings multiply faster than food: as Wallace, Franklin and Malthus have shewn. In such countries, men and women ought not to marry till they have established the means of rearing up the children they bring into the world.—T. C.]

BACHELOR, in all its various senses, seems to include the idea of youth, or immaturity. In general society, the term is applied to an unmarried man. In many ancient states, rigorous laws were put in force against bachelors, and there can be no doubt that they are not the most useful members of the community. In England, by 7 Will. III. 1695, an unmarried duke, of the age of twenty-five years, paid a tax of 12*l.* 10*s.* and a common person 1*s.* At present, every man of the age of twenty-one years, and upward, never having been married, who keeps one male servant or more, shall pay 1*l.* 5*s.* for each, in addition to the ordinary duties leviable for servants; and every man of twenty-one years and upward, never having been married, keeping one female servant, pays 2*s* 6*d.* in addition to the ordinary 2*s.* 6*d*—5*s* in addition for each, if he has two females servants; and 10*s.* in addition for each, for three or more female servants

Bachelor, an ancient denomination of knighthood, given to such as had not a sufficient number of vassals to carry their banner; or to such knights-bannerets as were not of age to display their own banner; or, to young cavaliers, little more than initiated to arms; or, in a very honourable sense, to him who had overcome his antagonist in his tournament

Knights-Bachelors, the lowest rank of knights, whose title was not hereditary. These are the knights of modern days.

Bachelor, in universities, one who has attained the first degree in the liberal arts and sciences, or the first degree in the particular study to which he devotes himself. At Oxford and at Cambridge, to attain the degree of bachelor of arts, a person must have studied there four years: after three more, he may become master of arts; and at the end of another series of seven, bachelor of divinity. He may commence bachelor of law after having studied it six years.

Bachelor, in the livery companies of London, is one who is not yet admitted of the livery; also called *yeoman*. The derivation of the word bachelor is much disputed It is probable, considering how greatly the manners of Europe have grown out of chivalry, that it originated solely with the military profession. It has been said to come from

Buccellarius, a kind of cavalry; from *baccalaria*, fiefs of twelve acres, the possessors of which were called *bachelors*, (though the fiefs might be called *baccalaria*, because their possessors were bachelors); from *baculus*, or *bacillus*, a staff, because the young cavaliers fought with staves; from *baccalaureus*, in allusion to the ancient custom of crowning poets with laurel, *bacca lauri*. It is possible that, in contradiction to what has been said above, respecting the sameness of the origin, the university bachelor may be derived from *baccalaureus;* though, in Italy, where alone the ceremony mentioned appears to have been practised, the universities are unacquainted with bachelors: but nothing seems more likely than that we have the word from *bas-chevalier*, [" sub-knight"] a French term for one below the dignity of a knight.

BACK, in brewing, a large flat vessel in which the wort is put to stand and cool before boiling. The ingredients of beer pass through three kinds of vessels. they are mashed in one; worked in another, and cooled in a third, called backs or coolers. See Brewing.

BACK-*gammon*, an ingenious game played with dice and tables, to be learned by observation and practice.

BACK-*staff*, an instrument formerly used for taking the sun's altitude at sea: it had its name because the back of the observer was turned towards the sun.

BACKING, in law, a warrant of a justice of peace, which is granted in one jurisdiction and to be executed in another, as where a felony is committed in one county, and the offender escapes to another: in this case, if proof be given of the hand-writing of the justice who granted the warrant, a justice in the other county indorses or writes his name at the back of it, by which he gives authority to execute the warrant in that other county.

BACON, the flesh of swine, salted, dried, and, generally, smoked in a chimney. As the history and customs relative to this savoury dish, would furnish but little instruction, we shall proceed to state the most approved methods of preparing it both in England and on the continent.

Somersetshire-Bacon, the most esteemed in England, may be made any time during the last three months of the year. When a hog is killed for bacon, the sides are laid in large wooden troughs, and sprinkled all over with *bay salt;* thus they are left for twenty-four hours, to drain away the blood and the superfluous juices. After this first preparation, they should be taken out, wiped very dry, and the drainings thrown away. Next, some fresh bay salt, well heated in a large iron frying-pan, is to be rubbed over the meat, until it has absorbed a sufficient quantity, and this friction repeated four successive days, while the meat is turned only every other day. If large hogs are killed, the flitches should be kept in brine for three weeks, and, during that period, turned *ten* times, then taken out, and thoroughly dried in the usual manner; for, unless they be thus managed, it is impossible to preserve them in a sweet state, nor will their flavour be equal to those properly cured

As the preservation of the salt used in this process, when carried on to a great extent, may be an object of economy, we shall state the following method of recovering the saline matter contained in these *drainings*, or in any other *brine*, whether from herrings, beef, or pork: it was communicated to us by a friend, who had seen it practised on the continent, where culinary salt is sold at a considerable price. He first added such a quantity of boiling water to the brine, or drainings, as was sufficient to dissolve all the particles of the salt. This solution he then placed in either an iron or earthen vessel, over a fire, which, by boiling, forced all the feculent and animal particles to the top, so that they were carefully removed by a perforated ladle. After the liquid had become clear, it was set aside for twenty-four hours, in a cool place, that the colouring matter might subside. But, as the combination it had formed with the boiled liquor was very tenacious, he contrived two different ways of separating it: 1. A solution of alum in water, one pint to an ounce of that substance, was gradually dropt into the cold liquor, in the proportion of a table-spoonful of the former to every gallon of the latter; and the whole allowed to stand for several hours; or, 2 If time and circumstances would permit, he filtered the liquor by means of long flannel slips, cut longitudinally by the web, but previously soaked in another strong and perfectly clear solution of salt: these slips were so immersed into the coloured fluid, that the projecting external end reached another vessel, which had been

placed much lower than that containing the brine, or drainings. When these particulars were properly attended to, the absorbed liquor became almost colourless, and pellucid. Having thus procured a clear liquid solution, nothing more was required than to evaporate it to dryness, in order to re-produce the salt in its original granulated form. We have faithfully reported the process, which may be imitated without difficulty, and at little or no expense. In our opinion, the second method of discharging the colour is preferable, as by this, no alum will be required, which only contaminates the salt.

Smoked Bacon, one of the most relished dishes of the Germans, is prepared in a manner similar to that adoped in the curing of the celebrated *Westphalia hams*. For the latter, however, animals that have been well fed, and allowed to roam at pleasure in the extensive moorlands of that province, are generally selected. And if credit be due to the report lately spread in London, by a native of Westphalia, that those delicious hams, so much esteemed in this country, are the produce of hogs, which frequently die of obesity, and were sold for half price to the ill-reputed German skinners (*schinder*), who export them to Hamburgh or Holland, we cannot, in justice to our friends, recommend them for their salubrity. The manner of obtaining them is nearly as follows: after the hams have been properly salted, rubbed, and wiped with dry cloths, in order to absorb all the impure juices, the cavities of the joints, as well as the bones themselves, are carefully covered with a mixture consisting of two parts of the best salt, perfectly dried, and one part of black pepper, coarsely powdered. As soon as this operation is performed, the hams are, on the same day, suspended in a chimney, where no other but wood fire is burnt, and which is usually increased during the first three days. The time of fumigation is regulated by the size of the meat, and generally extends from three to six months.

BADGE, in naval architecture, an ornament placed on the outside of ships near the stern, containing either a window or the representation of one.

BADGER, an animal resembling in its external characters, both a dog and a hog. The unequal length of its legs has introduced the expression *badger-legged*. Its flesh has a taste similar to that of wild hogs, and is much esteemed in Italy, France, and Germany. Indeed these carnivorous quadrupeds are themselves so very fond of pork, that a piece of such meat, placed over their burrow, is the surest inducement to their appetite, and will in a few minutes entice them above ground.

Besides affording a nutritive, but not easily digestible food, the skin of the badger makes excellent knapsacks, and covers for travelling-trunks, saddles, &c. because it is impervious to rain, and stands in need of no additional preparation for rendering it *water-proof*; a process we shall describe under the article LEATHER. The hairs or bristles of this animal are used for painters' brushes; and its penetrating fat answers a variety of useful purposes: for it is not only employed as an ingredient in injections for relieving nephritic complaints, or such as arise from obstruction in the urinary passages, but likewise externally, in rheumatic affections, especially those called *Siatica*, and for the cure of sore and chapped nipples in young mothers For paralytic diseases of the aged, it is asserted, that the hairy skin of this creature, when worn next the surface of the body, has been of eminent service, by stimulating the inert, cutaneous and muscular vessels into action: and there can be no reasonable objection against giving this simple remedy a fair trial for a few weeks, where medicines generally are ineffectual.

The crafty horse-dealers also employ the badger's fat in a singular manner, which involves a degree of fraud and cruelty. They pull out the hair in several places, and anoint the bare spots with this fat; when the hair grows again, it is of a white or grey colour, so as to give the horse a pyebald appearance, which probably inhances its value.

BAG, in commerce, is a term for a sack, or pouch, containing a certain quantity or weight of some particular commodity. Thus a bag of almonds is about three hundred pound; of aniseed, from three to four hundred pounds weight, &c. The best material for making compact and durable bags is hempen cloth (or cotton) previously steeped in a strong decoction of oak-bark, or tanner's waste.

Bag, in farriery, signifies a medicated external application, made with a view to recover a horse's appetite. For this purpose, one ounce of asafœtida,

with an equal quantity of powdered savin, are mixed together, put into a bag, and tied to the bit. Meanwhile the horse should be kept bridled for two hours, several times a-day, and as soon as the bag is removed, the animal will begin to eat. We have stated this piece of advice on the authority of the *Encyclopædia Britannica;* though we are inclined to think that such superficial applications will seldom avail. See FARRIERY.

BAGNIO, a term adopted from the Italian, and signifying a *bath:* in English it denotes a house for bathing, sweating, and cleansing the body.

BAG-PIPE, a musical instrumemt of the wind kind, chiefly used in country places, especially in Scotland. It consists of a bag and pipes or reeds.

BAITING, a practice derived from the barbarous ages, and one of those amusements which degrade the human character. Thus we hear of the baiting of bulls, or bears, by mastiffs, or bull-dogs with short noses, that they may take a firmer hold of their opponents.

The inhuman practice of bull-baiting ought not to be connived at by magistrates, especially about the metropolis.

BAKER, a person whose business is that of baking and selling bread. The origin of this useful profession is not ascertained, though it is certain that the first public bakers appeared in the East, and passed from Greece to Italy, about the year of Rome 583. Prior to that period, every house-wife baked her own bread.

BAKING, is the art of converting flour, or other farinaceous substances, into bread. As we propose to treat more fully on this subject, under the article BREAD, we shall here only explain what relates to a proper method of preparing it.

In domestic life, the baking of bread is frequently mismanaged; which may be ascribed to the following circumstances. Some women do not use a just proportion and temperature of water, so that the bread turns out either pasty, or too firm and heavy; others do not use a proper quantity or quality of leaven, or yeast, whence the bread acquires either an unpleasant bitterish taste, or the dough cannot rise, and consequently becomes tough and viscid; and others do not understand the due degree of heat required in the oven, so that it will be either under or over-baked. All these particulars deserve to be attended to, otherwise a bad and unwholesome bread will be produced. To survey, therefore, the whole process, which is one of the most complicated in chemistry, we shall here communicate a few general directions.

1. The flour, whether made of wheat, barley, or rye, ought not to be used immediately on coming from the mill; as in a fresh state it is too moist for making good and palatable bread; but it should be kept in a dry place, for several weeks, stirred every day in summer, and at least every other day in colder seasons, till it has acquired such a consistence, as renders it loose and yielding between the fingers.

2. As the dough will not rise, without giving it a proper leaven or yeast, this ought to be a principal object in families, as well as to bakers. If leaven be employed, it should on the preceding evening, be deprived of its hard crust, and dissolved with a little, scarcely milk-warm, water; then carefully mixed with about a third part of the flour to be used for baking, and kneaded into a soft dough, by adding more *tepid* water. A small quantity of flour is put on the top; and, thus prepared, it will be necessary to cover the trough with blankets, and suffer it to stand in a moderately warm place till the following morning, that it may rise and duly ferment. The remaining two-thirds of the flour must then be added, with a proportionate quantity of luke-warm water, and the whole kneaded into such an elastic dough as will draw into strings without breaking and not adhere to the fingers. In this state it is again covered, and allowed to stand (while preparations are making in the oven), and not disturbed till it begins gently to rise, when it should be formed into loaves.

3. A proper degree of heat is an essential requisite to the baking process. When the inner arch of the oven appears entirely white, it is generally considered as sufficiently heated. But this being a fallacious criterion, we would recommend the following: Place a handful of flour before the aperture of the oven, and if it turn of a brown colour, the heat is then nearly of the degree required; but if it become black, or remain white, in the former case the fire must be considerably reduced; and in the latter more fuel must be added. Lastly, all parts of the oven should be uniformly heated; and though we cannot enter into farther particulars,

yet the attentive house-wife will easily, from her own observations, regulate the degree of heat.

Remark. Musty flour, when baked into bread, is not only extremely detrimental to health, but it also imparts a bitter and nauseous taste. When such flour is not too strongly tainted, it may be corrected by first kneading it with leaven or sweet yeast, then making large holes with a wooden cylinder in the dough, filling up the cavities with flour that is perfectly sweet, suffering it to remain in this preparatory state till the next morning, then removing the dry flour carefully with long spoons or similar implements, and afterwards converting the dough into bread, with the addition of such flour as is not musty. By this simple process, the flour first mixed up will be sweetened, but that which has been left over night in the dough, is said to become so corrupted, hat it can be given only to animals [Spurred rye will bring on the dry gangrene —T. C.]

It has frequently been attempted, and not without success, to bake good, wholesome bread, with little or no barm. We shall here state *a method of raising a bushel of flour with a tea-spoonful of yeast;* first practised by James Stone. It is as follows: Put a bushel of flour into the kneading-trough or trendle; take about three quarters of a pint of warm water, and thoroughly mix with it a spoonful of thick, sweet barm; then make a hole in the middle of the flour, large enough to contain two gallons of water; pour in your small quantity, and stir it with a stick, so that it may, with some of the flour combining with it, acquire the consistence of batter for pudding; then strew a little dry flour over it, and let it stand for about one hour, when you will find the small portion so raised, that it will break through the dry flour scattered over it. After this, pour in another quart of warm water, while you are stirring in more flour, till it becomes as thick as before; then again shake dry flour over it, and leave it for two hours longer, repeat the same method about twice more, always suffering it somewhat longer to be at rest, and the bread will become as light as if a pint of barm had been used. Nor does this method require above a quarter of an hour more time than the usual way of baking; and the author of it asserts, that his bread has *never* been heavy nor bitter.

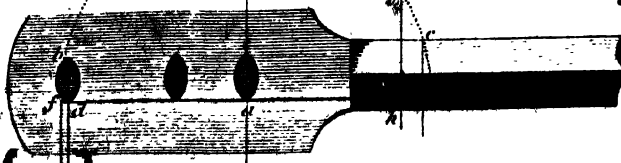
In summer, the water should be used blood-warm; in winter, or cold frosty weather, as hot as the hand can bear it without pain; while in the former season the dough should be covered up very warm, and strewed over with dry flour every time tepid water is added, to keep in the heat; after using six or eight quarts of such water to every bushel of flour in the gradual manner before described, it will be found that the whole body of flour which is mixed with the warm water, by means of a single tea-spoonful of barm, is brought into considerable agitation, so that it waxes or ferments without difficulty. See also Yeast, and Barm.

BALANCE, one of the six simple powers in mechanics, principally used for determining the equality or difference of weights in such bodies as are liable to this computation.

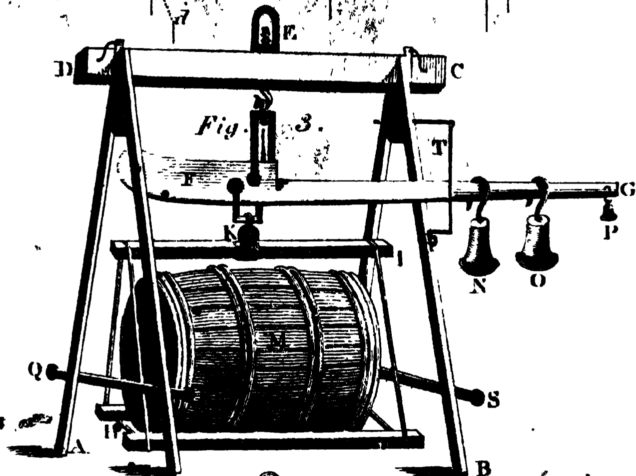
There are two kinds of weights principally used at present; the ancient, or the Roman steelyard, and the modern, which consists of a lever or beam suspended exactly in the middle, having scales or basins attached to each extremity. If the arms of the balance be of equal length, and similar weights placed in the scale, the balance will consequently be in *equilibrio*. But if one of the arms be in length to the other as ten to nine, the balance may still be so constructed, that both the arms with their scales shall equiponderate. This vile contrivance, however, justly deserves to be branded with infamy; because a weight of nine pounds suspended on the longer arm, will counterpoise another of ten pounds placed on the shorter one; but the fraud may be instantly discovered, by shifting the weight from the one scale to the other, in which case the balance will lose its equipoise.

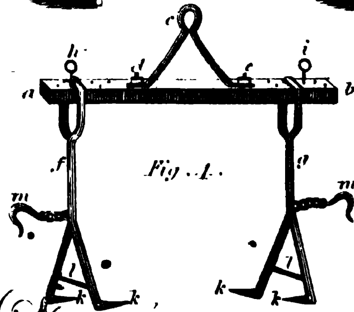
Description of Dearborn's *Improved Balance.*

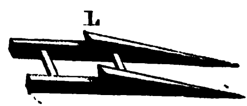
Fig. 1 Is a representation of that part of the common steelyard, in which the pivots are placed: a is the centre of motion, upon which the beam turns, b is the point where the article to be weighed is suspended; and c is the point where the poise is suspended, both being *above* the centre of motion, but c somewhat higher than b While the beam remains level, the horizontal distances of these points of suspension, are $a\ d$ and $a\ e$. Depress the larger end of the beam, until the point b falls to f, and the point c will rise to g. It is evident that the horizontal distance $a\ d$ is *increased* to $a\ f$, on the *falling* side of the centre; and that on the *rising* side, the horizontal distance $a\ e$ is











Dearborn's improved balance.

Shallus sc.

in the same time *reduced* to *a h*. Thus the descending power overcomes the ascending, and destroys the equilibrium at the moment the beam is moved from a level position The centre of gravity is also placed above the centre of motion, which must prevent the light beam from vibrating on its centre; if the larger end were made to balance the smaller, unless the former centre were placed below the latter. Hence the reasons why the common steelyard, and all beams constructed on these principles, must ever be liable to error, and applicable to fraudulent purposes.

Fig. 2. Is a representation of that part of DEARBORN's balance in which the pivots are placed, *a* is the centre of motion, on which the beam turns: *b* is the point where the article to be weighed is suspended, and *c* is the point where the poise is suspended, both being *on a line* with the centre of motion. While the beam remains level, the horizontal distances of these points of suspension are *a b* and *a c*; depress the larger end of the beam, until the point *b* falls to *d*, and the point *c* will rise to *e*; it is evident, that the horizontal distances are both reduced, and that this reduction of distances on both sides the centre of motion, is always equal or proportional. Thus, by placing the points of suspension on a line with the centre of motion, by fixing the centre of motion above the centre of gravity, and by making the arms of the beam in counterpoise, it preserves its vibrations when light or loaded; and hence the reasons why *no art* in management can render it a fraudulent instrument.

Fig. 3. Represents the balance with its apparatus. A B C D is a wooden frame, with an iron screw at E, on which the beam F G is suspended. The scale H I is attached to the beam by the clasp K, which slides on the bar K I, to be moved over the centre of the weight in the scale; the skid L is formed to receive the scale on one end, while the other end answers as an inclined plane, over which the cask M is rolled into the scale. When the scale is to be charged, it is fixed at a proper height, by turning the screw E until the scale will rest fairly on the skid, when the beam is elevated to an angle of 30 or 40 degrees above a horizontal line. The little weight P (called the balance weight) is a brass case, into which a sufficient quantity of shot is put, to produce an exact equipoise with the scale; if the weight of the scale varies by any cause, the shot is augmented or diminished accordingly, for which purpose the top of the brass case has a small screw to be taken out for making the change. The scale, when charged, rests on the skid, by which it is kept out of the mud, and at a suitable distance from the ground; the small end of the beam is then brought down by hand, which raises the scale and relieves the skid, if the weight in the scale be nearly under the clasp; if not, the beam is raised until the scale rests again on the skid, and the clasp is loose, which is moved by hand over the weight. The beam being again brought down, the poises N O are put on, and the skid is drawn out; when the poises are so placed as to produce a level beam, the two numbers being added, at which the poises hang, will give the weight of the article. The handles Q R and S, are for lifting the apparatus by hand, and transporting it small distances, without the trouble of taking it apart. T is a guard, which is useful when the scale is to be many times charged with a given weight of small articles, in which case the beam may rest in the guard, without taking off the poises, until all the draughts are weighed. The principles on which this balance is predicated require that the larger poises or weights attending it, shall be multiples of the smaller, therefore the following are the sizes, viz. 1 lb. 2 lb. 4 lb. 8 lb. 16 lb. and 32 lb. and the two sides of a beam may be graduated for any two of those weights, and may be sufficiently strong, for bearing any number required, for the largest draughts. Under or near the beginning of the graduated edge of every beam, on each side, is stamped the weight of the poise, for which the respective side, is marked, and in all possible variations of the weights, any article will be found to weigh alike, when weighed with the heavier weight alone, or the lighter weight alone, or with both together, or with any greater number which will produce an equipoise; hence arises an incontrovertible testimony of the accuracy of the system, and of the construction of the balance.

Balances of a small size are made for domestic purposes, and for shop-counters, which are found exceedingly convenient, when a tin scale is attached to the lower hook, and may be rendered more peculiarly so, by the addition of another scale, at sixteen times the distance from the centre, for weighing ounces.

Fig. 4. Is a representation of a grapnel for weighing casks and boxes with the balance, without removing them from the spot: *a b* is a bar of wood with holes, described by the black spots: *c* is an iron by which the grapnel hangs to the balance; it is secured to the bar by the bolts *d e*: *f g* are two irons, kept at proper distance by the bolts *h i*: *k k k k* are four points about three inches in length, which are entered under the ends of the cask or box, and lift it by the draught of the beam. The two points of each iron are kept about one foot apart, by the little bolts *l l*: *m m* are two hooks fastened by a few links to the irons; these hooks, being thrown over the bars Q R and S, in Fig. 3, keep the two irons separate, a sufficient distance for setting the apparatus over the next cask, without interference. The height of the whole should be nearly the height of a scale for weighing hogsheads, like that represented in Fig. 3, that either the grapnel or the scale may be used with the same frame. With this apparatus, but two assistants are necessary for weighing any number of casks, as the frame, with its appendages, is moved from one to another, and set over them in rotation, by two persons, with much less labour than would be necessary for removing a heavy cask

In the 17th volume of the American edition of the *Encyclopædia Britannica*, (which was published by Mr THOMAS DOBSON in, May 1797,) an instrument is represented in Fig. 1, of Plate 481, which, by the cursory reader, may be supposed to contain the principles of Mr DEARBORN's balance If the two instruments *had been exactly alike*, Mr. DEARBORN has indisputable testimony, that his balance was in existence in the year 1783, which was fourteen years prior to the publication of that volume; but, it will be shewn, that in correcting the errors of the common steelyard, these instruments are alike in *one particular only;* which is, placing the two points of suspension and the centre of motion in a right line; that in every other respect they differ; and that, in consequence of this difference, Mr. DEARBORN's balance is rendered one of the most extensively useful instruments for weighing which has been known; while that which is described in the *Encyclopædia*, is so contracted in its power, as to fall far short of the common steelyard. On examining Fig. 1. before mentioned, and reading the description of it, we find sufficient evidence, that an idea was never conceived, of using more than one counterpoise on the beam; if that were light, it could not weigh heavy articles: if it were heavy, it could not weigh light articles, consequently the range of the instrument must be so contracted as to render it of little use; and no mode of extending the range is intimated, except by adding another point of suspension on the short arm. Hence the author's remark, in page 779, column first, near the bottom: "it is usual to make as many divided scales on the long arm, as there are points of suspension on the short arm." Then two lines further on: "but the range of this instrument is not altogether at the pleasure of the maker."

In the construction of Mr. DEARBORN's balance, the range *is* at the pleasure of the maker; for, with but one point of suspension on the short arm, the range may be from one pound to *any quantity* which a beam of *any kind* can sustain; the range of one already made, is from one pound to seven thousand and five hundred pounds. This advantage arises from the application of weights which are multiples; using a lighter counterpoise for weighing lighter articles, and a heavier counterpoise, or both together, or any number, for weighing heavier articles, without any one of them exceeding 32 lb. which is the heaviest counterpoise required with the Patent Balance.

The place of the centre of gravity exhibits another essential difference. In Figure 1, it is placed somewhere in the long arm, depending on the scale to bring the beam to a horizontal position; consequently nothing can be weighed but in the scale, unless its weight be added to the weight of the article, or accounted for in some other way. In Mr DEARBORN's balance, the centre of gravity is placed exactly under the centre of motion, whereby small or loose articles may be weighed in a scale, which is balanced by a small weight hooked in at the end of the long arm; and on putting these off, the hook is ready for receiving articles which may be too large for the scale; the figures on the beam giving the exact weight in either case, rendering this balance an instrument of great convenience in markets and in families; for the same beam with which small articles are weighed in a tin scale, will weigh a quarter of beef on the hook. It will be observed, that the particulars here described, which give to Mr. DEAR-

BORN's balance such essential superiority, are entirely independent of the portable and convenient machinery which he has constructed to accompany the instrument for weighing heavy bodies, and which gives additional value to his system for weighing.

Some of the characteristics of a Patent Balance, which is now in use in the city of Philadelphia for weighing 3000 lbs. compared with those which it must have possessed, if it had been made according to the description given in the *Encyclopædia*, vol. 17, Plate 481, Fig. 1.

1st. The heaviest counterpoise belonging to the balance is 32 lbs. If it had been made on the principles of Fig. 1, the counterpoise must have weighed 112 lbs.

2d. The counterpoise to be lifted from notch to notch on the balance, for finding the exact weight of the goods, is only 16 lbs. If the construction had been on the principles of Fig. 1, the counterpoise to be lifted from notch to notch, must have weighed 112 lbs.

3. The smallest quantity which can be weighed with the above-mentioned balance, is one pound. If it had been made on the principles of Fig. 1, the smallest quantity it could have weighed would be seventy pounds.

4th. The number of notches on the Balance, corresponding to one pound each, are something short of seven and a half to an inch. If it had been made on the principles of Figure 1, the number of notches corresponding to one lb. each, must have been *fifty-one* to an inch.

BALANCE *of Trade*, the equal exportation of native commodities, and importation of foreign. When a nation imports to a greater extent than it exports, the balance of trade is said to be against it; that is, it loses by its trade. This is very clear. The native commodities of a nation are its income, its property: and it needs no subtile logic to discover, that where-ever purchases exceed the income, there is a tendency to bankruptcy. Where the income expended, and the purchases received, are equal, there is a convenient interchange of commodity. He that having cultivated a plot of ground, instead of subsisting himself upon the produce, exchanges it for that of some other soil, quantity for quantity, is obviously not the richer for his bargain: he has merely gratified his taste at the expense of his labour, his imports are equal to his exports; his expenses are equal to his income. If he can obtain the foreign article for a part only of his native produce, his wealth is actually increased; his exports are greater than imports; his income is greater than his expenses: but if he parts with his own native produce for a smaller quantity of foreign, he is a loser; his imports are greater than his exports; his expenses are greater than his income. [The effect of balance of trade being against any country, is to diminish the coin of that country, for balances of trade with foreign parts must be paid in money current every where.—T. C.]

BALDNESS, a defect of hair chiefly on the fore part of the head.

Among the pre-disposing causes of baldness, excessive indulgence in sensual gratifications, and particularly in wine and spirits, is perhaps the principal; though old age usually causes the loss of hair even in the most regular livers. In ancient Rome, the term *calvus*, or bald-pate, was frequently used by way of reproach for this deficiency, which then was in great disrepute.

In modern times, divers arts are practised to conceal a bald head, and a variety of preparations are offered to the credulous, in the daily prints, with the solemn promise that they are infallibly calculated to make the hair grow again. As these advertisers are, comparatively speaking, harmless chemical compounders, we do not wish to treat them with severity, so long as they confine their medicines to *external* applications.

In our opinion, baldness is incurable, when it arises from general debility, or an asthenic state of the system; but where it takes place in consequence of acute diseases, or during a tedious recovery from malignant fevers, the growth of the hair has frequently been accelerated by the following liniment: Take of the expressed juice of burdock root, virgin-honey, and proof-spirits, of each one ounce, mix them together, and anoint the barren part of the head several times a day, at the same time taking care to cover it with soft flannel, in order to promote perspiration.

BALE, in commerce, a cloth package of goods, and a customary quantity: thus, a bale of cotton yarn is from 300 to 400 weight.

BALL, in a general sense, is a round or spherical body, whether formed by nature or art. Thus the terraqueous globe which we inhabit, appears to have assumed that form, in consequence

A ball that weighs … pound, has a diameter of … inches

A ball that weighs (pound)	has a diameter of (inches)
42	4 4
32	4·0
24	3 5
18	2 7
12	2·4
1	1·9

BALLAD, a popular song, adopted to the lower class of the people. It is usually a simple tale, contained in three or four verses or stanzas.

BALL-*and-sock* instrument, is made to move horizontally, vertically, and obliquely, and used for surveying and astronomical instruments. Many of the joints in the human frame are on the principle of the ball and socket.

BALLAST, heavy matter, as stone, gravel, iron, &c. thrown into the hold of a ship, to sink her to a proper depth in the water, that she may be capable of carrying a sufficient quantity of sail without over-setting. The ballast regulates the ship's centre of gravity, upon the due situation of which her sailing and safety greatly depend.

In ballasting a ship, three considerations are to be kept in view: the centre of gravity, the centre of motion, and the *point velique*, or centre abaft the fore-mast, upon which the ship pitches. In the arrangement necessary for these purposes, the model, size, and form of the ship, must be consulted. All descriptions of ships should be balanced on one point as much as possible; and the placing the cargo, ballast, guns, or whatever the ship is to contain, is one of the greatest secrets in naval tactics. In a ship, of whatever form, the ballast must be placed in such a manner as to unite, as much as possible, the three points already mentioned; but little practical knowledge on this subject can be acquired otherwise than from actual experience. As general rules, it may be observed that, in a sharp-built ship, the ballast should be as low as possible; and, in a flat one, the reverse.

BALLET, a characteristic dance, consisting of three parts, the entry, the figure, and the retreat.

BALLOON. See *Aerostation*.

BALLOON, a round short-necked vessel used by the chemists for the process of distillation.

BALLOTING, a method of voting secretly at elections, in which, as the voter may follow his inclination without making a public discovery of it, his choice has the better chance of being independent. *Ballot*, is a French word for a *little ball*. The voter puts into a box, or other receptacle, a white ball or a black one, according as he wishes to say, *yes* or *no*.

BALLS, in the polished circles of society, are those nocturnal assemblies devoted chiefly to the entertainment of dancing. Whether public or private, the institution of balls appears to have been originally intended for the conjoint purposes of promoting health, by the exercise there mingled with mirth and social conversation, as well as for the refinement of manners, or what is more properly termed *good breeding*. (See that article.)

In large and populous cities, however, these excellent purposes are often in a great measure defeated; partly by a deviation from the genuine principle on which balls were first introduced, under the sanction of wise governments, and partly by connecting this amusement with collateral objects, such as suppers, masquerades, card parties, &c.

Consistently with our plan, we beg leave to observe only, that morality and health would be better consulted, if all public balls and masquerades were limited to a certain number of visitors; excluding every female who ventures to appear without a proper friend or relation; and, upon the whole, by adopting those excellent regulations which already subsist in the city of Bath, where *decorum* or good-breeding is the "order of the night"

Horse-balls, among farriers, are given only for the purpose of conveying into the stomach of that nice and noble animal, the more disagreeable drugs which it would not swallow in drenches.

Hence these balls should not exceed the size of a pullet's egg, and be dipped in sweet oil previous to their administration, that they may pass down the throat with greater facility. But as some horses have a strait gullet, and are remarkably averse to this method of taking medicine, it would be preferable to give them drenches or mixtures with bran, or other mashes. See FARRIERY.

Portable-balls for removing spots from clothes in general, may be thus prepared: take fuller's-earth perfectly dried, so that it crumbles into a powder: or soap stone, talc, or French or Venetian chalk, moisten with water, and knead the whole carefully together, till it acquires the consistence of a thick paste; form it into convenient small balls, and expose them to the heat of the sun, in which they ought to be completely dried. In this state, they are fit for use in the manner as follows: First, moisten the spot on your clothes with water, then rub it with the ball just described, and suffer it again to dry in the sun; after having washed the spot with pure water, it will entirely disappear, if owing to grease.

BALLS, in electricity, are two pieces of cork, or pith of elder, nicely turned in a lathe to the size of a small pea, and suspended by linen or silken thread, intended as electromers, to discover small quantities of electricity.

BALLS, in meteorology, luminous bodies, generally appearing at a great height above the earth, with much splendour. Their track is usually from north to south, and their velocity is very great. See METEORIC STONES.

BALLUSTRADE, a series or row of ballustres, joined by a rail; serving as well for rest to the elbows, as for a fence or inclosure to balconies, altars, staircases, &c. The heights of ballustrades vary according to circumstances.

BALM, (*Common,*) or *Melissa officinalis*, L is much cultivated by our gardeners, on account of its pleasant aromatic smell, resembling that of the lemon, and its fragrant, though roughish taste. See WOODVILLE's *Med. Bot.* pl. 147.

Formerly, the balm was held in very high estimation: PARACELSUS supposed it to possess virtues, by which human life could be prolonged beyond the usual period. In modern times, however, the properties of this agreeable plant are better understood: it yields, by distillation, a small proportion of an essential oil, of a yellowish colour, and a very grateful smell. A few drops of this oil, diluted in a glass of simple water; or strong infusions of the young shoots, drank as tea and continued for several weeks, or months, have proved of service to nervous and hypochondriacal patients, of a lax and debilitated habit. Either of these liquid preparations, when slightly acidulated with lemon juice, acquire a fine reddish colour, and may be taken with advantage in dry, parching fevers, as well as in cases of distressing flatulency, attended with eructations, where the first passages have previously been opened.

BALM (*Purple* and *White*) or *Melittis Grandiflora*, L. another species of the balm; it is delineated in *English Botany*, t. 636, and in CURT. Lond. *fasc.* 6. t. 39.

We have mentioned both these native plants, not on account of their diuretic properties, for which they were once celebrated, but the former, as affording fine aromatic flowers, which are eagerly visited by bees; and the latter, as being a fine ornament to a flower-garden.

BALNEUM, bath, in chemistry, a contrivance to modify and regulate the heat in various chemical processes, particularly distillations, by the use of different intermedia. When the degree of heat required is below that of boiling water, a vessel containing that fluid is interposed between the fire and the substance to be acted upon; and when a superior degree of heat is necessary, sand, or some other matter of a similar nature is employed.

BALNEUM MARIÆ, a water-bath.

BALSAM, an oily, resinous or liquid substance, flowing either spontaneously, or by means of incision, from certain plants, and used in the cure of several kinds of wounds, diseases, &c. Thus we have the Balsam of Copaiva; the Balsam of Tolu; the Balsam of Peru. There are likewise solid balsams, viz. Benzoin, Storax, and Dragon's blood.

BALSAMICS, a term used in an indefinite manner, but literally signifying *mitigating* substances, and very often applied to medicines of very different qualities, such as emollients, detergents, restoratives, &c. It appears to be a general character of balsamics, that they are hot and pungent, like the natural balsams and gums; while their internal use tends to increase the vital heat of the system. Hence they are commonly administered in those complaints which originate from a dis-

eased action, or a defective state of the interior organs; and as they can only be introduced to those parts by the stomach and the circulation of the fluids, it will be easily understood that these slowly operating medicines cannot be productive of great effects, unless continued for a considerable time.

BALSAMINE, or touch-me-not, the *Impatiens noli-tangere*, L. is one of the poisonous native plants, growing in moist and shady places. Its stalks are about eighteen inches high, and its yellow flowers appear in August. See WITHERING, 263.

The capsules of this plant, when touched by the hand, burst and throw out their seed with velocity; whence it has received its name.

Balsamine Seeds possess the deleterious property of producing violent purging, when swallowed inadvertently, especially by children; and inevitable death, when taken to any extent. Dr. UNZER asserts, that the bread baked in an oven which had been heated with the dry stalks of this plant, poisoned, and nearly destroyed a whole family.

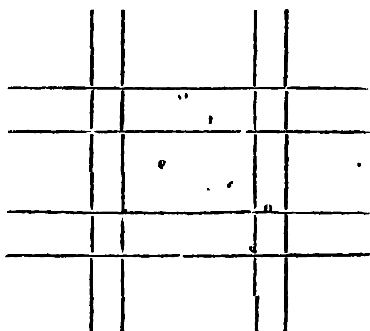
In dyeing, the leaves and flowers of the balsamine, according to M. BECHSTEIN, impart to wool a beautiful yellow colour.

This plant is also found in the United States.

BALTIC SEA. This may be reckoned an Inland Sea, that opens from the German Ocean, by an inlet pointing N. E. called the Skager Rack, and afterwards passing S. in what is called the Cattegat to the Sound of Elsinore, a narrow entrance, or Strait, where vessels pay tribute to Denmark. Thence the Baltic extends east, and north east, in 60° N. latitude, dividing into two branches, called the gulfs of Bothnia and Finland; the former reaching northward about 100, and the latter eastward, 70 leagues. Both of these gulfs are covered, or interrupted, by ice, during four or five months in winter. The greatest depth of the Baltic is said not to exceed 50 fathoms, and its shallowness gradually increases at the rate of 40 inches in a century. Tides are there unknown; and the waves are not of such magnitude as those of the German Ocean; but rising more abruptly, and in greater numbers, they are sometimes turbulent and dangerous. When violently agitated, this sea throws up, on the coasts of Courland and Prussia, amber in considerable quantities. In several places the variation of the magnetic needle is remarkable. In one place particularly, it points between the south-west and west; and in another it points to the north-west. The water of the Baltic is not very salt, on account of the many rivers which discharge themselves into it. Some persons who have analysed it, assert that it does not contain more than $\frac{1}{30}$th part of salt; whereas other sea water often holds $\frac{9}{10}$ths parts.

BAMBOE HABIT, an invention of the Chinese, by the use of which a person unskilled in the art of swimming, may easily keep himself above water. The Chinese merchants, when going on a voyage, always provide themselves with this simple apparatus, to save their lives, in cases of danger from shipwreck. It is constructed by placing four bamboos horizontally, two before and two behind the body of each person, so that they project about twenty-eight inches; these are crossed on each side by two others, and the whole properly secured, leaving an intermediate space for the body. When thus formed, the person in danger slips it over his head, and ties it securely to the waist: by which simple means he cannot possisibly sink.

Its figure is here subjoined.



BAMBOO, a very large species of the arundo or cane; it grows about the tropical regions, and was a native of Asia, but it has long since been introduced into the West-India Islands. It is used in building, in making bridges, vessels, boxes, caps, baskets, mats, and other utensils and furniture. Paper is likewise manufactured from it: it is the common fence for gardens and fields, and is used for pipes to convey water wherever it is wanted. The leaves are generally put round the chests of tea which are sent to Europe from China.

to form a kind of mat. The tender tops make a fine pickle.

[In the joints of the bamboo we often find small angular bluish siliceousstones, called Tabasheer.—T. C.]

BANANA, the fruit of the plantain, a species of palm. Dampier compares it, when stripped of its integuments, to a large sausage, in size and shape; and to fresh butter in winter, as to substance and colour. Its taste resembles that of an apple, or the pear called by some the *good christian*, which melts in the mouth like a marmalade.

BANDAGE, in surgery, a fillet, or roller, used in dressing and binding up wounds, restraining dangerous bleedings, and in joining fractured or dislocated bones.

The modern and more enlightened surgeons have, in some of the most important operations, relinquished the use of *tight* bandages, from a conviction of their tendency to do more harm than good. Thus it is certain, that the most expeditious cures of broken limbs, have generally been effected without any bandages; yet, as there is a necessity of keeping the injured limb in a steady posture, we shall expatiate on this subject under the head of FRACTURES. See also LIGATURES and TOURNIQUET.

BANDITTI, robbers who infest the southern parts of Europe, in troops. They are persons who live wholly unconnected with established society; but not unmindful of a certain legislation among themselves. They have even obtained the character of scrupulous honour; and rendered themselves so powerful as not to be treated like common highwaymen. Unable to dislodge them from their fastnesses, especially in the neighbourhood of Mount Etna, it has been found expedient to make the best compromise. The prince of Villa Franca, as a matter of prudence, has declared himself their protector: and such of them as choose to leave their forests, even temporarily, are safe, and receive an unbounded confidence, which they have never been known to abuse. Travellers put themselves under their care; and, it is said, that no one who has done so, ever had cause to repent of the proceeding. The name *banditti* appears to have originated with *outlaws*, called *bannitti*, to the miserable policy of placing persons in which situation, the existence of these pillagers of society is, probably, to be ascribed.

BANDY-LEGS, a vernacular expression applied to distorted or crooked legs. In some cases this is a natural defect in the birth, though it may more frequently be ascribed to an improper treatment of infants, by *indolent or officious* nurses. The former will sometimes suffer an infant, scarcely twelve months old, to stand for hours on its legs, while confined in a chair, or an absurd machinery contrived for walking: the latter are too impatient to give early specimens of a child's vigour, and daily try experiments with its tender legs, before they are able to sustain the weight of the body.

When an infant is born with bandy-legs, the timely and judicious use of the bandage may, by imperceptible degrees, correct this defect; but it requires more patience and perseverance than people in general are able or disposed to bestow. Hence we cannot suppress a remark made by the ingenious LEVRET, that this species of neglect is attended with more important consequences to the female than the male sex: for, as deformities of the lower extremities are very frequently connected with similar mal-conformations of those bones which form the waist, we may hence account for the repeated abortions in many mothers who pay the strictest attention to diet, and every other circumstance, during the period of gestation.

This unfortunate deformity, however, cannot be easily remedied after the child has arrived at a certain age: and we believe all attempts would be fruitless, and even hurtful, after the sixth or seventh year: yet there are instances on record, where Nature, unassisted by art, has occasionally performed a cure. Dr. UNZER relates the case of a young man, who was born and reared with legs so distorted, that he was obliged to walk on the sides of his feet and heels; but during his apprenticeship with a taylor, sitting continually with crossed legs, he remarked that his lower extremities began gradually to recover their natural direction, and that his ancles in particular spontaneously returned to their proper position. He at length escaped from his master, entered on the list of warriors, and thus gave the most convincing proof of the soundness of his limbs

BANE BERRIES, the production of the HERB-CHRISTOPHER, or *Actæa Spicata*, L (a native plant of the United States,) which is in a high degree poisonous. See WITHERING, 483

Although some foreign writers assert that this plant does not possess the deleterious properties which are attributed to it by LINNÆUS, yet we have reason to believe that its great astringency must be highly detrimental to cattle.

BANIAN-DAYS, a proverbial expression, imported from the Asiatic colonies, used for a short or indifferent dinner, or days on which no animal food is eaten; in allusion to the Banians, the mercantile cast among the followers of Brahma, who, believing in the metempsychosis or transmigration of souls, will not kill any living creature.

BANK, a repository for money, from *banco*, the Italian word for a *bench*; the Lombard Jews having introduced banking, by keeping benches in the market places, for the exchanging of money. Banks, in the principle upon which they are conducted, differ very distinctly from each other. Thus, the banks of Amsterdam and Genoa are standards of good and true money, in opposition to the current value of the clipt and worn coin which an extensive trade renders almost the whole circulation of a small state. The value of bank or standard money above that of currency, is called the *agio*. In speaking of money at Hamburgh and other places on the continent, we commonly hear of marks *banco*; that is, standard, or sterling money. The banks of Scotland keep what are called cash accounts, lending sums of money to responsible persons, receiving small sums in payment, and discounting a proportionable part of the interest of the great sum from the day on which each of these small sums is paid in, till the whole be in this manner repaid. All merchants, therefore, and men of business, find it convenient to keep such cash accounts with them, and are, consequently, interested in promoting the trade of those companies by readily receiving their notes in all payments, and by encouraging those with whom they have any interest to do the same. The banks, when their customers apply to them for money, generally advance it in their own promissory notes. These, the merchants pay away to the manufacturers for goods, the manufacturers to the farmers for materials and provisions, the farmers to their landlords for rent; the landlords repay them to the merchants for the conveniences and luxuries with which they supply them; and the merchants again return them to the banks, in order to balance their cash accounts, or to replace what they may have borrowed: and thus, almost the whole money-business of the country is transacted through the medium of these notes. The basis of all banking is the profitable use to which the banker or company can apply the capital which is deposited. An ordinary banker is a depositary in whose hands money is placed for convenience; and his business is chiefly that of discounting bills of exchange; that is, advancing money upon them before they are due. He deducts, upon whatever he advances, the legal interest till the bill shall become due. The payment of this bill, when due, replaces to the bank the sum that had been advanced, together with a clear profit to the amount of the interest. The banker who advances to the merchant whose bill he discounts, not gold and silver, but his own promissory notes, has the advantage of being able to discount to a greater amount, that is, to the extent of his credit, and is thereby enabled to make his clear gain of interest on so much a larger sum.

Added to this source of profit in money-dealings, there are others in the purchase and sale of bullion, foreign coin, &c. and on these foundations arose the

BANK *of England*. In the fifth and sixth years of William and Mary, (A. D 1694, 1695) in consideration of a loan to government of 1,200,000*l.* at an interest of almost eight *per cent.* a company was incorporated by the name of the "Governors and Company of the Bank of England," with a restriction by which they were prevented from dealing in any other than money concerns. Thus commenced the national debt. This amount was the capital of the company; and the interest, exclusive of its trade, in bullion, &c its profit In the 8th and 9th of the same reign, this capital was augmented to 2,201,171*l.* 10*s.* In the 7th of Ann, it was increased to 4,402,343*l.* at which time the company advanced a loan of 400,000*l.* and in the year 1714, another of 1,500,000*l.* In the 3d of George II. the interest on their capital was reduced to 5 *per cent.* and in consideration of an annuity of 100,000*l.* they agreed to deliver up exchequer-bills to the amount of 2,000,000*l*: which interest was afterward reduced from 5 to 4 *per cent.* and, some other annuities purchased by the bank being redeemed, the national debt was reduced to

1,600,000*l.* In 1742, this was doubled; a loan of 1,600,000*l.* being supplied. This latter sum was advanced at 3 *per cent.* and was that now called the 3 *per cent. annuities*. The debt was, therefore, 3,200,000*l.* the one half carrying 3 and the other 4 *per cent.*

In the year 1746, the company having in its possession unsatisfied exchequer bills, and being also a creditor of government for money advanced on certain duties for licenses to sell spirituous liquors by retail, amounting, together, to 986,800*l.* agreed to cancel the same in consideration of an annuity of 39,442*l.* the interest of that sum at 4 *per cent.* company contracted to advance the farther sum of 1,000,000*l.* into the exchequer, for which it received exchequer-bills. In return for this assistance, it was empowered to add the sum of 986,800*l.* to its capital, the interest, of which, as that of the other annuities, was reduced to three and a half *per cent* till the 25th of December 1757, and from that time allowed to carry only three *per cent.* The company of the bank were formerly obliged to keep in constant readiness a sufficient quantity of specie to answer all ordinary and even extraordinary demands, this has been dispensed with since the year 1797. The charter of the bank extends to the year 1833: for a renewal of their charters they have always paid government large sums of money. The chief privilege consists in the prohibition of all other companies, of more than six persons: from issuing bills payable on demand, or for any time less than six months. The permanent debt due to the bank from government, is upwards of eleven millions, bearing three *per cent.* interest: the capital stock of the company is likewise more than eleven millions, on which they pay a dividend of 10*l* *per cent.* to the proprietors. The profits of the company arise from the interest received from government on the permanent debt: on their annual advances on exchequer-bills, &c; from their allowance for receiving the contributions to loans, and for paying the dividends on the public funds; from dealing in bullion, and from their large discounts with a mere paper currency.

The affairs of this company are in the hands of a governor, deputy-governor, and twenty-four directors, who are annually elected by the general court.

BANKS *of America.* The commerce of this country, like the commerce of Europe, is no longer carried on by money payments, but by the transfer of bank credits and by bank notes. Money or coin, is of little more use in the present day than to pay for articles of provision, or small articles of merchandise that amount to sums below the value of a bank note, or of five dollars. Probably there does not exist at this moment in the United States, (1819) more than ten millions of real coin. The trade to the East Indies; the balance of trade against us in Europe; the high value of coin in Europe; and the consumption of gold and silver in articles of plating and gilding, to the amount of at least a million of dollars a year in the United States, tend to diminish coin here. Hence the commercial payments of our home trade must continue to be made in bank credit and bank notes manufactured at home; and which pass current, not on the faith of their being redeemed to their full extent in coin, but on the credit given to the corporations that issue them.

Doubtless the banking system in this country is upon a very bad plan, nor will it ever be upon a good one, until as in England there shall be but one incorporated bank, and the individual stockholders of every other banking company, be responsible each and every one for the notes issued on their joint credit, like other partners in trade. Bankers have no right to exclusive privileges for which the community is not amply paid.

The bank of the United States was incorporated by act of April 10, 1816. The nominal capital is 35 millions of dollars, of which the government of the United States hold seven millions, or seventy thousand shares at $100 per share. It went into operation on the 7th Jan. 1817. At the end of Nov 1818, it had in circulation $7,286,069 $\frac{49}{100}$ of bank notes, beside loans to government, loans to state banks, and money advanced on bills of exchange: and it had in its vaults, including $350,000 received from Havre by the ships Favourite and Belle, $2,739,626 $\frac{28}{100}$ in specie, as appears by the documents transmitted to Congress by the Bank Committee in Feb. 1819. This bank is under the management of 25 directors, of whom 20 are chosen by the stockholders and 5 by the government of the United States. Of these, not more than three-fourths of the directors elected by the stockholders,

and not more than four-fifths of the directors appointed by the President of the United States, shall be elected or appointed for the year succeeding their first appointment. The president elected by the stockholders, is however eligible every year. But no director shall hold his office more than three years out of four in succession. This principle of exclusion by rotation, is a favourite principle with the republican party of this country. It is very good in theory, and very bad in practice. So soon as a man becomes tolerably acquainted with his duties he is turned out of office.—T. C.]

BANK-FENCE, in rural economy, signifies the inclosure of ground with an artificial bank. In places where flat stones cannot be procured, the most durable and advantageous method of fencing in arable or pasture lands, is with turf or green sods, about five or six inches thick; the foundation five feet wide; the middle filled up with earth; the top about three feet broad, and planted with proper shrubs or dwarf-wood. As every agriculturist is acquainted with the manner of constructing such fences, we shall only remark, that they are, in many respects, preferable to the common hedges; because the latter, with their ditches, cover an almost incredible quantity of soil, while they neither afford sufficient shelter for cattle, nor can the herbage growing contiguous to them, be compared to that generally produced on the *sloping* sides of banks, where nettles and other aquatic weeds would not obstruct the vegetation of the more useful plants. It is, however, to be regretted, that manual labour in this country is at present so very expensive, that few farmers, excepting those who hoard up their grain, and wait for the *maximum*, or highest price, are either inclined or able, to defray the first, and unavoidable expense connected with the system of *bank-fencing*.

A subject of such extensive importance, we hardly conceive, is entitled to every [illegible]on from a wise and economical legislature, or at least deserves to be conducted on similar principles, and with the same patriotic spirit, as has lately been displayed in the different schemes of inland navigation.

BANKRUPT, one who, having been engaged in trade, is unable, or unwilling to pay his debts. In this case, the law takes the affairs of the insolvent man into its own hands; divides his property among his creditors as far as it will go; and releases him from the danger of farther molestation. Bankruptcy may either be forced upon a dishonest man, or coveted by an unfortunate one. In all cases, some act of bankruptcy must be committed, before a creditor can render his debtor a bankrupt; and an act of bankruptcy is an act of such a nature as evinces an intention on the part of the debtor to deprive his creditors of the security which they might have in the possession of his person or his property. As falling under this description, the following are considered in England, as acts of bankruptcy. 1. Departing from the realm, whereby a man withdraws himself from the jurisdiction and coercion of the laws. 2. Departing from his own house, and thus secreting himself. 3. Keeping in his own house, except for just and necessary cause, so as not to be seen or spoken with by his creditors. 4. Procuring, or suffering himself willingly to be arrested, or outlawed, or imprisoned, without just and lawful cause. 5. Procuring his money, goods, and chattels, and effects to be attached or sequestrated. 6. Making any fraudulent conveyance of his property to a friend, or secret trustee. 7. Procuring any protection, not being himself privileged by parliament, to screen his person from arrest. 8. Endeavouring or desiring, by any petition to the king, or bill exhibited in any of the king's courts against any creditors, to compel them to take less than their just debts, or to procrastinate the time of payment originally contracted for. 9. Lying in prison for two months or more, upon arrest or other detention for debt; because the inability to procure bail argues a strong deficiency in his credit, owing either to his suspected poverty, or ill character: and his neglect to give bail, if he is able to do so, can arise only from a fraudulent intention. 10. Escaping from prison, after an arrest for a just debt of 100*l.* or upward: since no man would break prison who was able and desirous to procure bail. 11. Neglecting to make satisfaction for any just debt by a trader having privilege of parliament.

BANKS *of Rivers*, are those natural boundaries within which every stream is confined, according to the magnitude and velocity of its current. But as the course of rivers is frequently rapid and irregular, taking different directions and often turning at acute angles, extensive inundations, especially in high spring tides, necessarily happen

from the overflowing of their banks. Hence it is of the utmost importance to every inhabitant in the vicinity of rivers, to possess some knowledge of the proper method of forming embankments, for the prevention of floods.

Although we cannot, consistently with our limits, attempt a full mathematical analysis, yet we shall lay down a few general hints, and maxims, by which the reader may be guided in the practical view of this subject.

1. The principal point to be ascertained, is the *elevation*, or the heights necessary to be given to such banks. This must be regulated by the additional quantity of water, which according to former experience, the river brings down during its freshes; and likewise by the distance, at which the artificial bank is to be constructed, from the natural boundary of the stream. On this important point, mistaken economy frequently defeats its own purpose. If, therefore, the embankment is to be raised at some distance from the natural banks of the river, both a comparatively smaller height and base will be required; the saving will be in the duplicate proportion of the former, and the works will be likewise the more durable, nearly in the same ratio; because, by enlarging the additional bed given to the swollen river, its velocity and power of ruining the works are, likewise, accordingly diminished. Unless, therefore, the freshes of the stream be loaded with fine sand, which might decompose the turf, the embankment should always be undertaken at a considerable distance from the edge of a river. By placing the artificial bank at half the breadth of the stream, from its natural banks, its channel will thus be nearly doubled, and the detached space, in general, afford excellent pasturage.

2. The next circumstance to be attended to, is, that the river will *rise higher*, when embanked, than it did at the time when it was suffered to overflow; and hence the difficulty of ascertaining to what height it may rise, from the greatest swell which has been observed in its former floods. For this reason, the utmost rise in some gorge, where the river could not extend farther, should be accurately marked, as far as can be remembered by the oldest inhabitants. Now the increased section in this place should be measured; and, as the water rises in a much greater proportion than the section, the latter must be increased nearly in the same proportion as the gorge already mentioned. Those who neglect this method of regulating the proper height of the embankment, by the greatest swell that has in former floods been observed in the plain, are in danger of constructing their banks too low, and consequently rendering them totally useless.

3. The whole embankment should, as much as possible, be conducted in an *uniform line*, and by the concurrence of the proprietors of *both* banks; because the general effect to be aimed at, consists in rendering the course of the stream straighter than it was before. All bends should be made less abrupt, by keeping the embankment farther from the river in all convex lines of the natural bank, and approaching to it nearer, where the latter is concave. Thus, the action of the waters on the embankment will be considerably diminished, and the duration of the work insured. On the same principles, we ought to proceed in fencing rivulets, or brooks, which empty themselves into a larger river; and whatever bends are given at its mouth to the two lines of embankment, they should always be made less acute than those of the natural brook; at the same time, an opportunity should be taken, of reducing an angle of this transverse brook, or, in other words, of conducting it with a more gentle flexion into the main river.

4. Particular care should be taken, to cover the *outside* of the dyke with compact pieces of turf, or green sods, closely united. For, if it admits the water, there is great danger of drenching the interior and more porous part of the wall, while the statical pressure of this fluid body tends to burst the bank on the land side; and thus the labour of months or years may be suddenly destroyed. Hence, too great attention cannot be bestowed on making and keeping it perfectly tight; so that the whole be one continued fine turf, and every bare spot must without delay be carefully covered with firm and fresh sods: nor should the rat and mice-holes be neglected.

Lastly, it deserves to be remarked, that a dry earthen bank, not firmly conjoined by grass-roots, will scarcely maintain itself against the pressure of the water with a slope of forty-five degrees, while a canal conveying a moderate stream cannot be supported, even with such a declivity. Those

banks, however, the base of which is as four to three of their height, will stand without danger in a moist soil: and this is not only the slope usually given them, but also observed in the spontaneous operations of Nature, in the channels which she forms in conducting rills and rivulets through the higher and steeper grounds. This natural form possesses both mechanical and mathematical properties, which justly claim the admiration of those who adopt her beneficent hints and maxims.

The only method of keeping banks impervious to water, is to *puddle* them. That is, when about two feet of the bank is built up on each side, let the intermediate space, amounting to three fourths of the whole width, be made thus. Put in the common dirt or earth in the vicinity of it, to which add water enough to make it a fluid paste. Let this be well raked backward and forward by iron rakes with the teeth not much apart; constantly add to, and rake the whole of the middle part of the bank, till it is completed. On well and laborious raking of common earth, in a fluid state, depends the goodness of a bank. The sides may be sodded. When well raked, moles find it difficult to get through; but where moles are in a bank, they must be exterminated; for the method of doing this see the article MOLE.

BANKS *of the Sea*, are those inequalities or elevations of the ground or bottom of the ocean, that may be compared to ridges or hills, with which the land is more or less intersected. Sea-banks sometimes project above the surface of the water, or at least leave this element so shallow, as to prevent a vessel from remaining afloat.

Sand-banks are very common in the North and Baltic Seas, so that navigators are obliged constantly to use the plummet and compass, to discover their distance and exact situation. As, however, these elevations frequently endanger the lives of our brave mariners, we have inserted this article, not with a view of intimidating those naval heroes, but for the information of persons whose business obliges them to cross the seas before mentioned, that they may provide themselves with an apparatus by no means expensive, and described under the head of BAMBOO-HABIT.

BANN, or BAN, a British word for a proclamation, is used for the public notification of an intended marriage. Unless a license be obtained from the bishop, no marriage can be solemnised in England until the bann has been published three several times in the face of the congregations, in the parishes of the man and the woman: so that if there be any just reason why such marriage should not take place, due opportunity may be given for exception being taken.

BANN OF THE EMPIRE, is a sentence that may be passed by the diet upon a prince or free city of Germany, in consequence of which, till such bann be recalled, the rights and privileges of the city or sovereign are taken away.

BANNERET, an ancient order of knights or feudal lords, who, possessing several large fees, led their own flag or banner. As the spirit of the feudal system declined, persons came to be created bannerets, and hence the institution must have become merely titular. The last knight of this description was sir John Smith, on whom the honour was bestowed after Edgehill fight, for rescuing the standard of Charles the first.

BAPTISM, a rite of the Christian religion, by which the members of its church are received into the communion. [It comes from the Greek word *Baptizein*, to dip.—T. C.]

BAPTISM, abusively, the ceremony of giving names to inanimate things; as the great bell of the Lateran, which was christened by pope John III. Among sailors, a ship is generally christened at the time of launching her; and a ceremony or custom observed on board merchantmen, when crossing the line, is known by this name. Persons and vessels that have not yet been under the line, are to be baptised. With respect to the ship, the office is very simple, and not less commendable: she is washed throughout with sea-water. As to the passengers, the mysteries require a more extended description. The oldest of the crew that has passed the tropic or line, comes with his face blacked, a grotesque cap on his head, and some sea-book in his hand, followed by the rest of the seamen, dressed like himself, each having some kitchen utensil in his hand, with drums beating; he places himself on a seat on the deck, at the foot of the mainmast, and at the tribunal of this mock-magistrate each passenger not yet initiated swears he will take care the same ceremony be observed whenever he is in the like circumstances. Then, by giving a little money, by way of gratification, he

is discharged, with a little sprinkling of water; otherwise he is heartily drenched with streams of water poured upon him. The ship boys are inclosed in a cage, and ducked at discretion. The seamen, on baptising the ship, pretend to a right of cutting off the beak head, unless redeemed by the captain. It has been justly remarked, that it is politic in commanders to allow a frolic, which serves to relieve the tedium of a protracted voyage.

BAPTISTS, a sect of Christians who maintain, in opposition to others, that the word *baptism* means *immersion*, and that, therefore, those who are only *sprinkled* are not *baptised*. The baptists in England, form one of the denominations of protestant dissenters. In other respects, they separate from the established religion for the same reasons as other dissenters. In 1538, a proclamation was issued against them; and several were burnt in Smithfield. Baptism is administered in the Greek church in the manner approved by the baptists; and it is even so directed, though not insisted on, by the church of England. In the latter, it is dispensed with, under the idea of danger to the health of infants; and infant-baptism, in reality, is the true point in dispute.

BAR, in music, a stroke drawn perpendicular across the lines of a piece of music, including between each two a certain quantity or measure of time, which is various, as the time is either triple or complex. In common time, between each two bars is included the measure of four crotchets. The principal use of bars is to regulate the beating of time in a concert.

BARBACAN, or BARBICAN, an outer defence to a city or castle, used especially as a defence to a city or walls; also an aperture made in the wall of a fortress, through which to fire upon an enemy.

BARBEL, in ichthyology, a genus of fresh-water fishes, comprising 31 species, which are principally distinguished by the number of rays in the vent-fin: their general characters are, a toothless mouth, three rays in the gills, a smooth and white body; and the belly-fins have frequently nine rays. The following ten are the most remarkable species. 1. The *Carp;* 2 The *Barbel* (of which we have here subjoined a more particular account), 3 The *Tench;* 4 The *Gudgeon;* 5 The *Bream;* 6 The *Roach,* 7 The *Dace;* 8 The *Chub;* 9 The *Bleak;* and 10. The *Golden fish.* for a description of which we refer to the order of the alphabet.

The Barbel, or *Barbus*, is one of the coarsest fresh-water fish. Its roe is not wholesome, and ought therefore to be thrown away, as the eating of it is frequently attended with nausea, vomiting, purging, &c. The natural history of this fish has escaped the attention of the ancients, though it is sufficiently curious.

Barbels resemble pike in their general shape, the head excepted; for the upper jaw of the former is more projecting, and they are also provided with four dependent fibres or rays in the gills, with which, while dexterously playing, they allure their prey, consisting of insects and small fishes. Their dorsal fin is armed with a remarkably strong and sharp spine, serving them as means of defence or attack, and with which they frequently cut the nets, or when incautiously handled, inflict severe wounds on their captors.

In size, the barbel rarely exceeds the length of three feet, and weighs from twelve to eighteen, or twenty-five pounds. Its most frequent places of abode are the sides of hollow banks in calm and deep waters. In the months of May and June, it deposits its spawn on the stones lining the beds of deep rivers, and between which, as well as poles, roots of trees, &c. barbels harbour during winter, in a compact and social state. Not unlike swine, they dig and excavate the soft banks with their noses, are fond of animal carcasses (particularly of human flesh, according to C. P. FUNKE, a reputed German naturalist,) and become exceedingly fat by living on the refuse of flax, steeped in stagnant waters. Hence we may also account for their unpalatable, and, perhaps, unwholesome flesh. They are so tame, that they may be easily caught by the hand; though we do not suggest so dangerous a method of taking them. For the particulars relative to the method of angling for barbel, we refer to the article CARP.

BARBLES, or BARBS, in farriery, are those small excrescences frequently appearing under the tongue of horses, as well as black cattle: they are known by two paps, which may be discovered by drawing the tongue aside. Few animals arrive at a considerable age, without being sometimes troubled with this complaint, which seldom proves hurtful, unless the part affected become inflamed by neglect.

and the acrimonious humours there collected should corrode the tongue, and produce such a degree of pain, as to prevent the animal from taking its proper food.

The method of curing this distemper, simply consists in cutting the excrescence close off with a sharp pair of scissars, or a knife, washing the wound several times a-day with brandy, or port-wine, and vinegar, taking care, however, that no hard food, but fresh grass, green herbs, and mashes, be given for several days, till the raw part be healed.

In those cases where black cattle are subject to a species of barbs, which grow quickly, and hang in the form of fleshy pimples under the tongue, they ought first to be clipt off, as before stated, then properly chafed with garlic and common salt beaten, together, and the mouth afterwards gently washed and rubbed with soft linen, dipt in lukewarm wine, or brandy and water.

BARILLA, or BARILHA, is properly, the Spanish name of a plant cultivated for its ashes, from which the purest mineral alkali is obtained, but likewise signifies that particular sort of vegetable alkali which is principally imported from Spain

There are four plants cultivated by the Spaniards for this useful purpose, namely, the *Barilla*, *Gazul*, *Gaza*, and *Salicor* But, as this account appears to be defective, we shall first present the reader with a list of those vegetables from which good barilla has been extracted in Britain, and next give a description of the most expeditious and profitable method of preparing this valuable material, for the various processes of washing, bleaching, &c.

Among the British plants, from which barilla or mineral alkali may be obtained, we shall at present enumerate the following, and then describe them in their alphabetical places

1. Two species of the *Salsola*, L or SALT-WORT

2. Two species of the *Salicornia*, L or GLASS-WORT, and SAMPHIRE

3 The *Zostera marina*, L or GLASS-WRECK.

4. Two species of the *Triglochin*, L or ARROW-GRASS

5 The *Chenopodium album*, and *maritimum*, L. or White and Sea GOOSE-FOOT

6 The *Atriplex portulacoides*, and *littoralis*, L or SEA PURSLANE, and GRASS-ORACH.

7. The *Plantago maritima*, L. or SEA-PLANTAIN

8 The *Tamarix gallica*, L or French TAMARISK.

9 The *Eryngium maritimum*, L or SEA HOLLY

10 The *Sedum Telephium*, L or Orpine STONECROP, or LIVE LONG

11. The *Dipsacus fullonum*, L or Manured TEASEL, and,

12 All the species of the *Cynara* and *Carduus*, L or the ARTICHOKE, and THISTLE, when cultivated either in the sea-shore, or in any soil irrigated with sea water

Barilla, as an article of trade, ought to possess the following properties it should be firm, hard and heavy, though porous, dry, and sounding on percussion, of a bluish colour, and impart, on breaking it, a flavour slightly resembling that of the violet By these criteria, it may be easily distinguished from pot-ash, though it would be difficult to procure a barilla consisting purely of mineral alkali, as the very best sort of the former generally contains a small proportion of common salt. According to the experiments made by Mr. KIRWAN, and published in the first volume of the *Transactions of the Royal Irish Academy*, in 1789, the barilla exported from Spain, contains carbonic acid, carbon, lime, clay, and siliceous earth, but such as is very pure, also contains both common and Glauber's salt, and water From the small quantity of carbonic acid discoverable in Spanish barilla, he concludes that its mineral alkali is for the most part combined with it in a pure or caustic state; and that its bluish colour must be ascribed to the matter of carbon in a similar way, he attributes the green or blue colour of pot-ash to its combination with magnesia

This important article of commerce, is, in proportion to its degree of purity and strength, classed according to the following places, from which it is imported 1 The barilla made at Alexandria; 2. That from Alicant, 3 Carthagena, and 4 Bourde, or Smyrna

Various methods and schemes have, in this country, excited the ingenuity of speculative men, in the production of this valuable substance, for which large sums are annually paid at foreign markets Those of our readers, who apply their attention to experiments of this useful nature, will perhaps, be gratified by the following specification of Mr. JAMES

King's patent for his new-invented *British Barilla*, granted in 1780 As his exclusive privilege is now expired, we shall communicate the process nearly in the patentee's own words. He first takes a quantity of ashes obtained from burning the loppings or branches of ash-wood, oak, beech, elm, alder, and any other kind of green wood and brambles, in the proportion of one-fourth; and a similar quantity of ashes obtained by burning the green vegetables, known by the name of fern bracon, bean and pea-straw, and whin ashes; also common field and highway thistles; the stalks of rape and mustard seed. and the bent, or rushes, that grow by the sea shore. One half of the ingredients being thus procured, they are then passed through a fine sieve, placed on a boarded floor, and carefully mixed with a similar quantity (making the other half) of soap boiler's waste ashes, which must be intimately blended together with a shovel. Next, he adds one hundred weight of quick-lime to twelve times that quantity of the other materials, and likewise intermixes them thoroughly. After this preparation, the whole is put into large square iron pans, and a sufficient quantity of sea-water is poured on it to dissolve the lime, ashes, &c. while the mass is stirred with an iron rake, to effect a more minute intermixture A coal fire is now lighted under the pans, and kept briskly burning forty-eight hours, without intermission; at the same time, the pans are continually supplied with sea-water, in order to impregnate these materials with a greater degree of the saline quality, till they acquire a proper consistency for calcination in a melting furnace, known by the name of *calcar*. This apparatus is constructed in the usual manner, except that there is a wall above the grate-room, to separate the fire from the materials laid upon the bottom. An intense degree of heat is used in this calcar, by means of which the saline mass boiled in the pan is completely dissolved, and afterwards kept in a state of fusion for one hour, during which time, the volatile part is expelled, and a fixed alkaline salt remains: thus, being cooled in iron pans, produces our British barilla, resembling that imported from Spain. Mr. King also declares, in the preamble to his patent, that this new chemical compound is calculated to serve as a substitute for manufacturing crown and broad window-glass, and also bottles, as well as for making soap and alum to much greater advantage, than any other material hitherto used in the production of those commodities.

[A kind of barilla is also made by decomposing in a reverberatory furnace, Glaubers' salt, with charcoal, and refuse iron The sulphuric acid is decomposed by the charcoal, and uniting to the iron, is scummed off. Some add chalk —T C]

BARING *of Trees*, in horticulture, is the removing of the earth from the roots of those which are planted in a dry soil. This operation should be carefully performed in autumn, without injuring the roots, around the trunk, so that the winter rains and snow waters may penetrate deeper in the ground, which, towards spring, should be covered up again with manure; because, at that season, the frequent night frosts might otherwise prove destructive to the tree.

BARK, in the dissection of plants, is the exterior coat of trees, corresponding to the skin of animals As these are furnished with a cellular membrane covering all the fleshy parts, and usually replete with white granulated fat, which can be liquified only by heat; so are plants surrounded with a bark abounding with oily juices, by means of which, Nature has rendered them inaccessible to cold; because the spiculæ of the ice are prevented from fixing and freezing the fluids, which circulate through the vessels Hence it is that evergreens continue their verdure at all seasons of the year, because their bark contains an unusual proportion of oil, more than is dissipated by the heat of the sun.

Dr. Darwin considers the bark of trees to be similar to that of their roots, of which he conceives is to constitute a part; inasmuch as it consists of an intertexture of the vessels that descend from the plume of each individual bud to its radicle, and form its Caudex. The root-bark, however, is provided with lymphatics for the absorption of water and nutritious juices from the earth, and is covered with a moister cuticle, while that of the stem has similar vessels for absorbing humidity from the air, and is furnished with a drier cuticle.

Beside the purposes to which the bark of trees may be applied, and which have already been enumerated, there is a considerable quantity of mucilaginous or nutritious matter contained in the inner rind, or bark of the holly, elm, and also in that of the haw-

thorn, gooseberry, furze, or other trees armed with prickles, for preventing the depredations of animals. This mucilage, he conceives, may be used in times of scarcity, as food, either for man or for cattle, or at least for the purpose of fermentation. He remarks, that the inner bark of elm-trees, when stripped off in the spring, and boiled in water, may doubtless be converted into a *palatable small beer*, with the addition of yeast.

The quantity of bark on a tree may be increased by pinching off the flower buds, as soon as they appear; but, if the former be wounded, by any accident, the edges of the dead rind ought to be carefully cut off, without injuring the living bark, and a mixture of white lead, and boiled oil (See CANKER,) be applied, to preserve the wounded parts from air, moisture, and insects. The following method of cure, which is stated to have been successfully practised where the bark of a tree had recently been torn off, we give on the authority of Dr. DARWIN It consists simply in again fastening the same piece of bark, or in tying down another piece from a tree, belonging to the same species; the edges of the wound and bark being carefully adjusted, in consequence of which, the whole will combine in the same manner as the vessels of a scion unite with those of the bark belonging to the engrafted stock.

The bark of plants is liable to peculiar diseases, as well as to be preyed upon by insects, which frequently prove destructive to the tree. One of its most common enemies is the *bark worm*, which infests and perforates its substance; and unless the parts affected be cautiously removed by the knife, and the superficial wounds plastered over with a mixture of wax and turpentine, (or Forsyth's Composition) the stem will in process of time become cankered, stunted in its growth, and ultimately fall a sacrifice to the disease

M. BUFFON has ascertained, by repeated experiments, that trees stripped of their bark the whole length of the stems, do not live longer than three or four years. It deserves, however, to be remarked, that when thus deprived of the whole bark, and suffered to die gradually, they afford a more compact, heavy, and more durable timber, than if they had been felled in their healthy state. The reason of this improvement is obvious, as those oily and astringent fluids, which are secreted for the uniform nourishment of the bark, are absorbed, and deposited on the fibres of the wood, which, during the progressive dissolution of vegetable life, acquire what nature had provided for the supply of the external integuments. Yet there is one disadvantage arising from the privation of the bark, perhaps tantamount to the additional value of the timber, namely, that the farther increase, or growth of the tree, is for three or four years effectually checked

The *barking of trees* ought, in our climate, to be performed in spring from about the middle of April to that of May; because at that time the circulating sap facilitates this operation, which in dry seasons, is not only attended with additional labour, but the bark also will be of inferior value

With respect to the *extent* of stripping the oak-bark from trees, a wide difference of opinion appears to prevail. Some owners of large tracts of wood, and great admirers of timber, cautiously prohibit the removal of the bark nearer than *six* inches to the ground; about which spot they suppose the tree to be felled · while others enjoin it to be done as near the ground as possible, provided that in this operation there be no part of the root laid bare Mr S HAYES, the author of an excellent "*Practical Treatise on Planting*," published in 1796, inclines to the latter opinion; and adds, that the advocates for the former method would, on more accurate investigation, save themselves much unnecessary trouble, to little purpose, if not to their material injury.

The inner and more delicate part of the bark, especially that of the ash and lime trees, was used by the ancients, for writing and communicating their sublime ideas to posterity, prior to the invention of paper.

In economy, as well as in many of the practical arts, the utility of different barks is very great and extensive, for instance, that of the oak for tanning leather, and manuring the soil, the Peruvian, cinnamon, quassia, willow bark, &c. in medicine and for culinary uses, that of the alder and walnut trees in dyeing; and others again for a variety of purposes, such as the bark of the cork tree, &c. &c. Without detailing the particular and curious processes adopted by foreign nations, for rendering the barks of various trees essentially useful, we shall briefly state, that the Japanese make their beautiful paper of the bark obtained from a species of

the mulberry tree, called *morus*; the natives of Otaheite manufacture their cloth of the same tree, as well as the bread-fruit and the cocoa trees; the Russians and Poles produce their shoes worn by the peasantry, twist ropes, and form a variety of other useful articles, of the inner bark of the lime tree; the Germans have for the last twenty years, converted the bark of the common black and white mulberry trees into excellent paper. An analytical account of the last mentioned article, interspersed with many new and curious facts, we propose to give in the sequel.

A patent was lately granted to Mr. WHITBY, for his improved mill, calculated to grind bark for the use of tanners It is performed by a number of cutting wheels, that are fixed upon axles, and chop the bark to pieces; which then fall through an eye, and pass between two large cast iron plates, with grooves or furrows that are cut either hollow, or are bevelled square The lower plate is made to move in a circular direction, with a view to facilitate the entrance of the bark into the eye. These plates are set in motion by the mechanism commonly employed in mills

This machinery, when moved by a horse, grinds 3 cwt. of bark, in one hour; but as the plates which constitute the chief invention in this mill, may be made of any circumference, according to the power by which they are impelled, the quantity ground in a certain time, will vary, in proportion to their size. The advantages stated to be derived from Mr. WHITBY's contrivance are, a saving of the bark, and greater expedition in the process of tanning: for the rind thus reduced, without being pulverised, *spends* more rapidly and completely in the pits, than that prepared in mills of the common construction.

BARK, in medicine, see *Cinchona*.

BARK, a small vessel with two or three triangular sails. It carries about 200 tons.

BARLEY, or *Hordeum*, L one of the most useful culmiferous plants, producing mealy and saccharine grains, which are principally used for malting and brewing beer. As the different species and varieties of barley are but imperfectly described in English botanical books, we shall here attempt to give a more satisfactory account, and also state, in a summary manner, the native places and qualities of the various sorts:

1. The *Hordeum distichum* (S. *æstivum*,) L. or SUMMER BARLEY. It bears flat ears, divided into two rows, containing large grains, and grows wild in Tartary, on the banks of the Saamara; in the vicinity of Babylon; and in Sicily. This species requires a loose rich soil, and must be sown in dry weather, in March; there are two varieties:

a. The *Hordeum distichum nudum*, or the Large Naked Barley, bearing smooth, heavy grains, that afford excellent flour, which, when mixed with that of rye, makes a very palatable nourishing bread, and may therefore be used for puddings and pastry. The beer brewed of it is of superior richness and flavour; it likewise yields, on distillation, a greater proportion of spirituous liquor than rye: hence it deserves to be preferably cultivated.

b. The *Hordeum frutescens*, or Bushy Barley, one grain of which often produces ten stalks, with broad dark green leaves: it is sown late, and generally about midsummer; soon ripens; is more prolific, but produces smaller grains than the former variety, and easily degenerates. The Germans sow it very thinly, and in a moist, heavy soil.

2. The *Hordeum vulgare*, (S. *polystichum*,) L. or the Common Barley of four rows It is productive of longer, though thinner ears and grains, than the first species: and as it thrives well on inferior soils, it is frequently cultivated in preference to the former. In various parts of Germany, and especially in Thuringia, the common barley is very generally sown in autumn, and is not affected by the severest winters.

A variety of this species is the *Hordeum cœleste*, or the WALLACHIAN BARLEY, also called EGYPTIAN CORN It produces ears and fruit in every respect similar to the former, except that it easily sheds its grain: from which excellent bread is made in Germany, as likewise cakes, groats, &c. Its sowing time is the month of March, when it is deposited in a well-manured middle kind of soil.

3. The *Hordeum hexastichon*, L. or SIX-ROWED BARLEY. This sort is uncommonly fruitful, so that it is said to produce one-third more in quantity than any other species (except the next following;) though, in ordinary seasons, the grains of two of the rows, do not attain to maturity. It is sown in a well prepared and tolerably rich soil, either in April or about 28 September; in the former case, it may be

mowed so early as midsummer-day. This species, however, is not so proper for malting and brewing beer, as for being reduced either to groats and flour, or converted into ardent spirits.

4 The *Hordeum zeocriton*, L. or BEARDED BARLEY, or RICE BARLEY with short and coarse stalks, as likewise short though broad ears, divided into two rows. When cultivated on a good soil, and thinly sown, it is the *most productive of all the species of barley*, and possesses the additional advantage, that it does not droop its ears, nor lodge, even in rainy seasons. Each row contains from twelve to fifteen small grains: these yield an excellent white flour, which, for most culinary purposes, may be substituted for that of wheat. In England, the best home-brewed ale is produced from this grain; for the culture of which, we shall give a few directions in the sequel

Only two kinds of barley are known in Pennsylvania, viz. summer and winter barley. The first generally weighs about 6 lbs in the bushel lighter than the other, and is a precarious grain, being very subject to be injured by the vicissitudes of the weather To prepare the ground for a crop, plough it in the autumn, and let it lie in ridges all winter, in the spring cross plough, and sow the grain, then harrow twice, the second time crossing the first. The grain ought to be put in as early as possible; and as we can harrow at least two weeks before we can plough, an experienced farmer recommends to sow the seed without any ploughing in the spring, after the ground has been twice well harrowed. An accidental comparative experiment taught him, the greater increase of produce in a field which had been only well harrowed in the spring, beyond that which had been both ploughed and harrowed. It is to be understood, however, that both fields had been ploughed in the preceding autumn.

The first variety of the first species, noticed by Dr WILLICH, is also cultivated in Pennsylvania, and much esteemed. It may be sown either as a summer or winter grain. When roasted and ground, it is used by many persons as a substitute for coffee.

Cattle thrive very well on barley straw, especially if timothy has been sown in the autumn on the same ground.

Calcareous soils, which have been long in cultivation, and frequently manured, will yield abundant crops of barley Oats reared under the same circumstances, are weak and puny.

Barley from La Plata and Algiers has lately been introduced into the United States: the first is the larger of the two. The grain is double the size of the common barley.

An acre and a half of ground near Philadelphia, produced in 1803 nearly one hundred bushels of barley.

In the autumn of 1802, a friend sowed an acre with two bushels of barley which came from England, the lot had been in grass, and previously to being sown, a crop of potatoes was taken off. The produce was 74 bushels.

Buckwheat in blossom, ploughed in, proves an excellent preparative for winter barley.

Cultivation. Barley, in general requires a dry, light, mellow, and rich soil: hence extraordinary care is requisite where it is to be sown in clay. Immediately after the foregoing crop is removed, the land ought to be ploughed, which lays it open to be mellowed by the frost and air. In order to promote this effect, *ribbing*, or a peculiar method of ploughing, has been introduced to expose the greatest extent of surface. For the improvement of dry clayey land, Professor BRADLEY recommends a manure of rich dung, ashes, chalk, or lime; and for some particular soils, malt-dust or soot are very useful; but, according to Sir HUGH PLAT, soap-boilers' ashes are the most fertilising substance for the growth of barley, even upon barren grounds.

The comparative advantages of *drilling* and *broad casting*, are stated by Mr. PETER SMITH of Horn-church, Essex, in England, as follows: in the last week of February, 1793, he drilled three acres of turnip-land with barley, at twelve inches intervals with two bushels of seed per acre; it was scarified and harrowed across, the latter end of March, and horse-hoed, the second week in April; at the same time he sowed the grass seeds, which produced fine plants, far superior to the broad-cast The produce of the drilled barley was eighteen quarters three bushels, from three acres; a quarter contains eight bushels

On the same day he sowed three acres of broad-cast in the same field and state of cultivation, with three bushels of seed per acre, and also sowed the grass-seeds at the same time. The produce of these three acres

amounted only to fifteen quarters and three bushels.

In the 3d volume of the *Bath Society Transactions*, Sir J. ANSTRUTHER relates, that the difference of produce between the crop of barley drilled, and that sown in broad cast, was about 20 bushels per acre, besides near two bushels of seed saved. The drills were 18 inches wide; the grain dropt by the hand.

As it is of great consequence in the production of this grain, that it may ripen equally and uniformly, to prevent that inequality which would render it less valuable, we shall communicate the following method of remedying this defect It is certain, that barley which comes up speedily in a dusky soil, will gain great advantages over seed-weeds: to forward, therefore, its vegetation, some farmers take out about one third from every sack of seed-barley or bear, to allow for the swelling of the grain, which they steep thoroughly in clean water, for at least twenty-four or thirty-six hours, according to the more or less dry constitution of the season. For our part, we would prefer steeping the grain; because in this manner all the light and unripe grains swimming on the top, may be easily skimmed off, and thus perhaps the *smut* at the same time prevented Although *quick lime* has often been recommended to be mixed with the wet barley, before it is sown, yet we agree with those who are of opinion, that it poisons the seeds, absorbs part of its useful moisture, and injures the hands of the sower. As clean water imparts no tenacity, the seed will scatter properly; but being swelled in the proportion of three to four, or two to three, it is necessary to use a fourth or third part more in bulk, to harrow it in, as quickly as possible, after it is sown; and, if convenient, to give it the benefit of a fresh furrow By this method, it appears above ground, at the farthest, in a fortnight, if these particulars be duly attended to.

A correspondent of the Bath Society, (Mr J. CHAPPLLE, vol 3) states, that in the remarkably dry spring of 1783, he soaked his seed-barley in the black water taken from a reservoir which constantly received the draining of stables. As the light corn floated on the surface, he skimmed it off, and suffered it to rest twenty four hours. On taking it from the water, he mixed the seed-grain with a sufficient quantity of wood ashes, to make it spread more regularly, and sowed with it three fields. The produce was *sixty bushels per acre*, of good clean barley, without any *small* or *green* corn, or weeds, at harvest. He also sowed several other fields with the same seed, *dry*, and without any preparation, but the crops were poor, producing only twenty bushels per acre, and much mixed with green corn and weeds.

There is a species of this grain which was introduced into Britain about thirty years since, by Mr. HALLIDAY, and is hence called by his name, or sometimes, *Siberian Barley;* it is possessed of qualities that entitle it to particular consideration as an object of importance in agriculture. From a quart of it sown in May, 1768, he procured nearly a bushel, which he sowed in April 1769, in drills drawn by a plough; and from this he reaped thirty-six bushels of clean corn. Since that period, Mr. HALLIDAY has made many experiments to ascertain the merits of this prolific grain as bread-corn, and as proper for malting. He accordingly informs us, in the second volume of the *Georgical Essays*, published in 1771, that its flour makes excellent bread, peculiarly retentive of moisture; and the ale brewed from its malt has a fine colour, flavour and body. (See the variety of our *second* species, from which it will appear that this grain is the same which Dr. LOCHSTER, in his Latin Dissertation, *On the Medicinal Plants of Norway*, feelingly characterises, by calling it the *Heavenly Barley*, because it is equally grateful and efficacious.)

As a proof of the extraordinary fecundity of barley, and how much the fertility of the soil contributes to the increase of vegetable productions, we shall mention an instance which occurred in the summer of 1797, at Reichenbach, in Upper Saxony. Two grains of our third species being planted close to each other in a common garden soil, grew briskly, and spread with no less than one hundred and thirteen stalks, which almost uniformly produced long ears: these contained the surprising number of two thousand five hundred and thirty-four grains, of which two thousand two hundred and five were perfectly ripe and sound, but the remaining three hundred and twenty-nine were of inferior size and weight. According to this computation, *one bushel* of barley, in a rich and mellow soil, might occupy in planting, at least *twenty acres*.

We presume that the following ad-

ditional observations on the culture of this valuable grain, made by a Norfolk farmer, will not be unacceptable to the practical reader. The best soil in general, is that which is dry and healthy, rather light than stiff, and yet of sufficient tenacity to retain the moisture. On such land, the grain acquires the best colour and body, is the most nimble in the hand, and has the thinnest rind; qualities which eminently recommend it to the malster. But, if the land be poor, it should be kept dry and warm; in which case it will often bear better corn than richer land in a cold and wet situation.

The best seed is of a pale colour and brightish cast, without any deep redness or black tinge at the tail A slight shrivelling of the rind proves it to have a thin skin, and that it has sweated in the mow; both being favourable circumstances. As this grain will grow coarser every succeeding year, it should never be sown for two successive seasons on the same soil

Sprinkling a little soot over the water in which seed barley is to be steeped, has been of great service, by securing it from the depredations of insects. In very dry seasons, barley that has been wetted for malting, and begins to sprout, will come up sooner, and produce as good a crop as any other If sown after a fallow, three times ploughing is necessary. On lands well manured, clover may be sown with barley; the former of which, after harvest, affords good fodder during the following winter, as well as from the next spring to July, when the land should be fallowed till the succeeding spring, and again sown with barley and clover: this method does not exhaust, but promotes the fertility of the ground, while it produces large crops. The lightest lands are fit for receiving the seed in March; those of a moist nature, in April, because all soils liable to be infested by weeds, bear the best crops when sown late, with a view to stifle their growth by the ascendency of the barley.

Although the broad cast, at two sowings, is the common method, and the usual allowance from three to four bushels per acre, yet much grain is thus unnecessarily wasted Half the quantity, and even less, if sown equally, would not only afford a better crop, but the corn also would be less liable to lodge; for weak stalks, standing close together, are less capable of resisting the force of winds, or supporting themselves under heavy showers.

Unless the land be very light and rich, the method of setting and drilling will not answer Although one root will produce eighty stalks, all having good and long ears filled with superior grain, yet it is to be apprehended, that this process of planting is too expensive in a country where manual labour is performed by free-born citizens. Hence it would be preferable to sow thin on poor lands, in order to allow sufficient room for the nourishment of each plant; as it is proved by experience, that this simple method is the most beneficial

It has farther been suggested, when the barley is sown and harrowed in, that, after the first shower of rain, the land should be rolled to break the clods; which, by closing the earth about the roots, will be of great advantage to it in dry weather. After the barley has been above ground three weeks or a month, it should again be rolled with a heavy roller, to prevent the sun and air from penetrating the ground to the injury of the roots This rolling, before the barley branches out, is said to be attended with another advantage, namely, that it will cause the plant to spread into a greater number of stalks, so that if they be thin, the ground will thus be filled, and the stalks strengthened. Whether this expedient be proper for all soils, indiscriminately, we are inclined to doubt, though we do not hesitate to approve of it for very light lands, which are neither loamy nor otherwise too stiff

Lastly, if the blade grow too luxuriantly, as is the case in warm and wet springs, mowing is said to be preferable to feeding it down by sheep, because the scythe removes only the rank tops, but those animals, being fond of the sweet end of the stalk next the root, will often bite so close as to injure its future vegetation

With respect to the time when barley is fit to be mowed, farmers frequently fall into the error of cutting it before it is perfectly ripe, thinking it will attain its perfect maturity, if they allow it to lie in the swarth This, however, is a very common error, as it will shrivel in the field, and afterwards make but an indifferent malt, it also threshes with more difficulty, and is apt to be bruised under the flail. The only certain test of judging when it is fit to mow, must be from the drooping and falling of the ears, so as to double against the straw In that state, and not before, it may be cut with all ex

pedition, and carried in without danger of heating in the mow. To obviate such accidents, and secure it from being mow-burnt, it is advisable to prepare a large sheaf or two sheaves, of straw, closely tied together, which should be placed in the centre, when the stack is commenced; and as the layers of corn rise, other sheaves must be put on the first; so that when the whole stack is completed, and the sheaves are removed, a funnel, or vent-hole, may be continued from the bottom to the top. After withdrawing the sheaves, the stack should be covered with a bottle of straw, before it is thatched.

Barley lying in the mow unthreshed, will keep for one or two years, if the above stated method be adopted. But when this grain is converted into malt, it can with difficulty be preserved longer than *one* year, without being infested by *weevils*. One of the best remedies to destroy these vermin, is dry worm-wood laid in the malt. For farther information on this head, see MALT.

Numerous have been the attempts to cure the *smut* in barley and other kinds of grain; a disease which by some is attributed to the generation of certain minute insects that breed in light and corrupted corn, sown in a moist and unfavourable season; but by others, and with more probability, to the influence of the atmosphere, wafting perhaps insects from such regions as are infested with them. See article SMUT.

The best sort of barley is that which is thick in the grain, smooth, weighty, inclining to a whitish colour, and neither too old nor new. Mr JOHN KIRBRICH, an eminent malster at Harleston, England, asserts, that out of a comb of *discoloured barley*, more than two bushels will not, in most instances, work on a malting floor, nor can such grain, in his opinion, be relied upon for seed, as it does not vegetate better in the ground than on the floor. He therefore advises farmers to sow bright barley, or at least such as is kiln dried, which he knows from experience will vegetate; or to dry it in the spring by exposure to the sun; an expedient that may probably produce an effect similar to that of kiln-drying. We are much inclined to doubt the latter part of this information, though we allow Mr. KIRBRICH the credit of having stated an useful fact, as far as it relates to the process of malting, but so long as the *corculum*, or heart of the seed, is not injured, we are of opinion that it will always germinate, independently of any external discoloration.

Uses.—Besides the almost incredible quantities of barley used in brewing ale and beer of different kinds, the consumption of this grain in broths is very considerable, especially in Scotland and Germany; in both countries *barley broth* is as common a dish as *soup* in France. Hence *pearl barley* is prepared in peculiar mills, where it is freed of the husk, and reduced to the size of small shot, by grinding away all the exterior parts to the very heart of the grain. The Scots and Germans, however, are more saving in their domestic economy, especially the lower classes of people, who frequently perform that process by hand mills, or more commonly, in *stamping mortars*, where the barley is freed from its husks, and rendered fit for culinary purposes. The latter are of a very simple construction, and may be very easily made, by excavating a heavy and firm block of wood sufficiently deep, from eighteen to twenty-four inches, and then adapting to it a wooden pestle, at the lower end of which a few large iron nails with smooth heads are generally fixed, for more effectually striking the barley and separating its husks. Such an implement is also useful for blanching wheat, oats, and many other articles for culinary purposes: we, therefore, seriously recommend its introduction into every family, which is desirous of reducing the consumption of bread corn, and lessening the dangers of adulteration.

Properties.—Barley has, from the earliest ages, been considered as wholesome and nutritive food for man and cattle. In diseases of the kidneys and the breast, as well as in that state of the body where it is said to abound in acrimonious humours, decoctions made of this grain, sufficiently strong, and acidulated with vinegar and sugar, are eminently useful. See also, WORT.

As a cooling and diluent beverage, barley water is of essential service to febrile patients, and in all inflammatory cases, where preternatural heat and thirst prevail, but to promote its salutary effect, the grosser parts, which remain after decoction, ought not to be swallowed.

BARM, or YEAST, used in the composition of bread, to render it light. When the art of brewing became known, this ingredient, which is much better adapted to the purpose than any

thing previously used, was discovered. It is the spume which arises on the surface of the beer in fermentation.

Dr. TOWNSON, in his "Travels in Hungary," gives the following recipe for making a ferment, which may be used as a substitute for yeast in the composition of bread

"The ferment is thus made: Two good handfuls of hops are boiled in four quarts of water; this is poured upon as much wheaten bran as can be well moistened by it; to this are added four or five pounds of leaven: when this is only warm, the mass is well worked together to mix the different parts. This mass is then put into a warm place for twenty-four hours, and after that it is divided into small pieces about the size of a hen's egg or a small orange, which are dried by being placed upon a board and exposed to a dry air, but not to the sun: when dry they are laid by for use, and may be kept half a year. This is the ferment, and it is to be used in the following manner: For a baking of six large loaves, six good handfuls of these balls are taken and dissolved in seven or eight quarts of warm water. This is poured through a sieve into one end of the bread-trough, and three quarts more of warm water are poured through the sieve after it, and what remains in the sieve is well pressed out: this liquor is mixed up with so much flour as to form a mass of the size of a large loaf: this is strewed over with flour, the sieve with its contents is put upon it, and then the whole is covered up warm, and left till it has risen enough, and its surface has begun to crack: this forms the leaven. Then fifteen quarts of warm water, in which six handfuls of salt have been dissolved, are poured through the sieve upon it, and the necessary quantity of flour is added, and mixed and kneaded with the leaven; this is covered up warm, and left for about an hour. It is then formed into loaves, which are kept in a warm room half an hour; and after that they are put into the oven, where they remain two or three hours according to the size. The great advantage of this ferment is, that it may be made in great quantities at a time, and kept for use."

BARN, in husbandry, a covered building or place, with vent-holes in the sides, for laying up any kind of grain, hay, or straw.

This kind of store-house being so well known to all rural economists, no farther description will be necessary: but as several plans have been proposed for its improvement, we shall give an account of those which appear the most worthy of notice.

In the sixteenth volume of Mr ARTHUR YOUNG'S "*Annals of Agriculture,*" we find the following description of a barn, &c. communicated to the editor by the Rev ROGER KEDINGTON, of Rougham, near Bury St. Edmunds, England: "Let the underpinning be of brick or stone, two feet high above ground, and let the sides be boarded: the roof of the barn will be best covered with reed or straw, and those of the stables with slate, or glazed tile: because they must be more flat, and the water which runs from the roof of the barn would injure most other coverings. At each end of the barn, and over the back-door, small doors, four feet square, should be fixed, at the height of twelve feet from the ground; the two former for putting corn in at the ends, and the latter for filling the middle of the barn, after the bays are full. All the bays should have a floor of clay or marl, and the threshing-floor be made with hard bricks, which will be sufficient for all sorts of grain, except wheat and rye; and for threshing them, it will be good economy to have planks of oak or red deal, well fitted together and numbered, to be laid down occasionally, and confined by a frame at their ends. A barn built on such a plan would hold a great deal of corn, and be filled most conveniently: and if stacks of corn were built at each end, they might be taken in without any carting. If more buildings are requisite, two may be added on the back-side, like the stables in front: otherwise, if doors are made under the eaves on the back side, as directed at the ends, and stacks be placed opposite to them (just far enough to avoid the eaves dropping), by placing a wagon between them and the barn by way of a stage, those stacks may be taken in without carting; which method prevents a great waste of corn and much trouble. The spars of the roofs of the stables rest upon the upper sills of the sides of the barn, and the outside wall of the stable is eight feet high; the barn supplying the highest side, and one end of each stable; and the stables in return are buttresses to the barn, and strengthen it greatly."

This building is of the following dimensions: The length of the barn inside is 68 feet; its width 22; the height of the sides 17 feet; of the front doors 15 feet; of the back doors 8 feet

6 inches; the stables at each side, in length 26 feet 6 inches; in width 14 feet; the door 4 feet: the threshing-floor has in front an entrance of 11 feet; behind, of 9 feet 6 inches; and the width of the porch is 14 feet. The whole expense of erecting this fabric, in the year 1791, was stated to be nearly 300*l*.

Mr ARTHUR YOUNG has, in the same volume, inserted a plan for a barn, and other buildings necessary for cattle. The dimensions of this structure were given in consequence of a request made by the late General WASHINGTON to the author, that he would send him a sketch of a good barn, and the necessary out-buildings, proportioned to a farm of five hundred acres. The threshing-floor is large enough for three men to work on, who in the course of a winter, can thresh the corn produced on such a farm.

This plan appears to us, by far the most advantageous of any that has fallen under our observation; we have therefore been induced to describe it, for the information of our readers.

The inner width of the barn is 27 feet square, on each side of the threshing floor. The porch 11 feet 4 inches, by 12 feet 3 inches. Threshing-floor 39 feet by 20, on its upper end, and 12½ feet at the small door of the porch, which is 6½ feet in width. The great door at which the carts enter with corn, 14 feet 9 inches. The sheds for cattle on the four longitudinal sides of the bays, are 27 feet by 12. Mangers, 2 feet broad, out of which the cattle eat their food. The passages for carrying the straw from the threshing-floor to feed the cattle, are between 2 and 3 three feet wide. Each passage has a door; there are four principal posts to each shed, beside the smaller ones, and gutters for conveying the urine to four cisterns, from which it is every day thrown upon dunghills, placed at a convenient distance. From the mangers to the gutters there is a pavement of bricks upon a slope, laid in such a manner as to terminate 6 inches perpendicular above the gutters; which pavement is 6 feet broad from that edge to the manger. The gutters are from 18 to 20 inches broad. There are four sheds for various uses, one at each corner of the threshing floor. At each end of the barn there are two yards with a shed, to be applied to any purpose wanted, one for sheep, surrounded with low racks, and the other divided for a horse or two, loose, if necessary: the other half is for yearling calves, which thrive better in a farm yard, than when stalled. These yards are inclosed by walling, or pales. The main body of the barn rises 14, 16, or 20 feet to the eaves. There are various sheds placed against the walling, as this is the cheapest way of sheltering cattle that has yet been discovered. Should the number of cattle intended to be kept, be greater than here admitted, a circular shed may be erected fronting the small door of the porch, and the hay-stacks be conveniently disposed near those sheds appropriated for cows, horses, or fat cattle. Corn-stalks must be built on the opposite side of the barn.

In the year 1797, a model of a barn, upon a new construction, was presented to the *Bath Society*, by Mr DOBSON, carpenter, of Norwich, who received a premium for his contrivance. The difference between the common barn, and that just mentioned, is as follows: The area of the former, 1475 square feet; 24,429 cubic feet for corn only; 702 cubic feet of timber; the latter, according to the model, 1472 square feet, the area: 30,900 cubic feet for corn only; and 445 cubic feet of timber. By this calculation it appears, that a barn built according to Mr DOBSON's plan, gains on one in common use, of the same area, 6474 cubic feet of space, and requires 257 cubic feet less of timber: and as there is nothing in its construction which would increase the price of workmanship, the cost of one on this plan, and another of the common kind, would be as 445 to 702, and the mathematical strength of the former is obvious.

A representation of the model above alluded to, is given in the sixth volume of the *Repertory of Arts and Manufactures*.

BARN-FLOORS. The best kind are to be found, according to Mr. MARSHAL, in the district of Cotswold, Gloucestershire: they are from 12 to 14, by 18 to 20 feet; some of *oak*, others of *stone*; but a species of earthen floor, which is made here of the calcareous earth of the sub-soil, a kind of ordinary gravel, and the chippings of free-stone, is considered to be superior to floors of stone, or any other material, except sound oak plank. The great excellence of these floors is owing partly to the materials of which they are made, and partly to the method of forming them, which is, perhaps, peculiar to that district; it is described as follows.

"Earthen barn-floors, are made, in other places, of *wet* materials; a kind of mortar, which, as it dries, is liable to crack, and requires some months after it is made, to dry it hard enough for use: on the contrary, the materials in the practice under consideration, are worked *dry;* they of course do not crack, and are ready for use as soon as finished. The materials, mixed together, are sifted twice over: the first time through a wide sieve, to catch the stones and large gravel, which are thrown to the bottom of the floor; the next, through a finer sieve, to separate the more earthy parts from the finer gravel, which is spread upon the stones; and upon this, the more earthy parts; making the whole about a foot thick, and trimming down the different layers closely and firmly upon each other. The surface being levelled, it is beaten with a flat wooden beetle, made like the gardeners' turf-beater, until the surface become as hard as a stone, and rings at every stroke, like metal. If properly made, they are said to last a great number of years, being equally proof against the flail and the broom.

"These materials, it is true, cannot be had in many districts, but the principle of making barn-floors with *dry materials* being known, other substances than these which are here in use, may be found to answer the same purpose."

The barn-floors generally used in most parts of the kingdom, consume a quantity of large and valuable oak-timber, often such as might be converted into two and a half inch ship-timber; they last only from fifteen to twenty years, and require frequent repairs. Hollow beech-floors, which were introduced a few years since, on account of the very high price of oak timber, are found not to wear more than seven or eight years. We think it necessary, therefore, to give a description of a moveable barn-floor, invented by Mr. John Upton, of Petworth, Sussex, for which he received a reward of 30 guineas, from the Society for the *Encouragement of Arts*, &c. in the year 1796.

"This floor effectually prevents a waste of corn, in threshing: it gives an addition of at least one foot in the height at the doors, by which means a higher load of corn can be admitted; and also, as the horses do not draw the wagon up an ascent, and upon a slippery floor; but upon a hard bottom, and level with the farm-yard, two horses can perform the work, where four are now generally used. It affords a warm and convenient shelter for hogs, when it is down, and, when turned up, it may be used as a stable, ox-stall, hovel, or cart-house; two men can place or displace it in five minutes; and, from it allowing, at all times, an easy access to dogs and cats, under it, it affords no harbour for vermin.

"The following are statements of the materials used, and the expense of the barn-floors, respectively:

"*Barn floors now in common use.* The original floor laid on the ground, with three sills, and two-inch oak-plank, which in general lasts from fifteen to twenty years, costs 19*l.* 10*s.* The hollow-floors on brick quoins, with two and a half inch oak-plank, costs 31*l.* 10*s.*

"*John Upton's barn floor.* The new-constructed hollow-floor is composed of oak-plank, 5 feet 8 inches in length, and 1½ inch thick; whereas, three-fourths of the plank used in the original floors, are 14 feet in length; the whole expense 23*l.* 10*s.*

"The plank for the last-mentioned floor may consist of deal, beech, or elm; as they will be perfectly free from decay by damps, which will considerably lessen the expense of the new-constructed floor: these are the estimates when the materials are supplied by a carpenter. When they are furnished from the estate, a very considerable advantage arises to the landlord, as the new-constructed floor is composed of small scantlings, which may be obtained from short-timber, much inferior in value to those used for the other floors.

"When there are more than one barn in a farm-yard, this floor may be farther useful, as it may be removed from one barn to another, and save the expense of at least one out of three.

"It is supposed, that a floor constructed in this manner will last for one hundred years, or indeed, as long as the barn; because it is perfectly free from damps, on account of the distance at which it lies above the ground, with a free current of air passing under it when down; and when it is turned up (which it probably will be at least half the year), it will be as free from decay as the posts or beams of the barn. See Farm-yard.

BAROMETER, an instrument of modern invention, for measuring and ascertaining the weight of the atmo-

sphere, as well as the height of mountains, and likewise, foretelling, with tolerable accuracy, the probable change of the weather. That such an instrument must be of extensive utility to every person engaged in the active pursuits of life, whether those of gardening or agriculture, or in the various departments of the domestic and useful arts, will be universally admitted. Hence we propose to bestow a considerable share of attention on this interesting subject.

History and analysis. When GALILEO, in the beginning of the seventeenth century, discovered that water could not ascend in a pump, unless the sucker reached within 33 feet of its surface in the well, he justly concluded that the ascent of water in pumps, was effected by the pressure of the atmosphere, and not by the power of suction; that a column of water 33 feet high was a counterpoise to one of air of an equal diameter and base, the height of which extended to the top of the atmosphere; and that consequently the water could not be attracted any farther by the sucker. This important discovery induced his great pupil TORRICELLI, to substitute a column of mercury for that of water; because the former fluid being about 14 times heavier than the latter, he wanted, according to that proportion, only about 29½ inches of quicksilver to determine the accuracy of his experiment. He accordingly found that, after having filled a glass tube with mercury, and inverted it in a basin of the same semi-metal, it descended in the tube till it became stationary at about 29½ inches above the surface of that contained in the lower vessel.

Many years, however, elapsed after this experiment, before any notice was taken of the circumstance, that this pressure of the air considerably varied at different times, though the tube was uniformly kept in the same situation. Indeed, these variations in the mercurial column, were too obvious to remain long unnoticed; and philosophers began, minutely, to mark their degrees. As soon, therefore, as this point was properly attended to, they observed that the changes in the rise and fall of the mercury were in general very speedily succeeded by variations in the weather. Hence, the instrument obtained the name of *weather-glass*, for which purpose it has, since that period, been generally employed.

It is surprising that the ancients were unacquainted with the laws by which the ambient air presses on our bodies as well as on all inanimate matter; and that OTTO GUERICKE, a German, to whom the world is indebted for the discovery of the air-pump, was the *first* who excited the attention of philosophers to this important subject. Although TORRICELLI had previously ascertained by his experiment made in the year 1646, that the mercury in a tube of four feet in length did not remain stationary at 29½ inches, but varied according to the greater or less degree of density of the atmosphere: yet it does not appear that he applied this great discovery to the purpose of predicting the *future*, or impending changes of the weather. Even prior to that date, namely, in 1643, experiments were instituted, both at Florence and Rome, with the Torricellian tube, and, in 1648, PFRIER, a Frenchman, made use of two similar instruments; one of which he left in a valley, while with the other he ascended one of the highest mountains of Auvergne: and thus he observed that the atmosphere on the top of the hill did not press upon the mercury with a force equal to that observed in a lower situation, where he found the quicksilver much lower than in the former region. and hence he judiciously concluded, that the air must be lighter, or more rarefied, in proportion to the altitude of places. But that these remarkable changes were in any degree connected with the present, or future, constitution of the weather, was doubtless discovered by GUERICKE, though Mr. BOYLE, whose talents and genius deserve the highest admiration, improved and applied it to philosophical purposes. This assertion is amply supported by a passage in a printed work still extant, and entitled "*Casp. Schotti Technica curiosa,*" (ii. 22. p. 52); by which it appears, from a letter addressed to the author, by GUERICKE, that the latter had constructed a tube filled with mercury, on the top of which fluid he placed a small wooden figure, that rose and fell with the quicksilver, pointing out with its finger, or index, the variations in the gravity of the air, and at the same time the concomitant changes of the weather.

The compound barometer, the tube of which is filled not only with mercury, but likewise with another coloured fluid, was invented by CARTESIUS and HUYGENS, much about the same time; but the latter considerably improved it, by using a double tube, and

mixing the water with one-sixth part of aqua-fortis, to prevent its congelation in winter.

The *conical* or pendent barometer was contrived by M. AMONTONS; the well-known *diagonal* barometer, by Sir SAMUEL MORELAND; the *wheel* barometer, by Dr. ROBERT HOOKE, who likewise improved HUYGENS' double barometer above mentioned: the rectangular horizontal barometer was invented by BERNOUILLI, or rather CASSINI, and the credit of another invention, by which four tubes (containing mercury, and a lighter fluid alternately) are connected together, is likewise due to AMONTONS.

The *marine* barometer was also invented in the beginning of the 18th century, by Dr R. HOOKE, and afterwards rendered more perfect by M. PASSEMENT, who, by the simple, but effectual expedient, of twisting the middle part of the common, or Torricellian tube, into a spiral of two revolutions, prevented the oscillations of the mercury on ship-board. By this ingenious contrivance, the shocks which the mercury sustains from the motions of a ship, are effectually broken: as, from the turns of the instrument, the impulses are transmitted in contrary directions.

But of all the instruments contrived for the purpose of ascertaining the specific gravity of the atmosphere, that of MAGELLAN, in the year of 1765, deserves a distinguished place; as it points out not only the changes occurring in the atmosphere, but likewise, and in a very sensible manner, the different degrees of temperature of the air.

Among the *travelling* barometers, that of M. de LUC, improved by J. H. LUZ, is the most useful and commodious. A *wind barometer* has also been contrived by Mr. WILKES, of which we propose to give an account under the article, WIND.

A great variety of other useful instruments have been invented since the days of TORRICELLI, upon similar principles, and with mechanical additions more or less complicated, but it must be acknowledged, that the simple barometer of his invention is the most exact, though not the most sensible balance for weighing the atmosphere, and has therefore been most generally adopted.

Rationale. M. de LUC, not satisfied with the different hypotheses brought forward by WALLIS, HALLEY, LEIBNITZ, MAIRAN, &c. to explain the variations of the barometer, has satisfactorily refuted the conjectures of all his predecessors, and endeavoured to establish his own, which is founded on a supposition, that a column of air, loaded with vapours, is lighter than a column of pure air, of equal bulk. He consequently asserts, 1. That the density of air is the immediate and *only* cause that supports the mercury; and 2. That the more elastic the air is, the less does it press and weigh upon its base; but though there is considerable ingenuity in this explanation, it is by no means conclusive.

Soon after the publication of this theory, M. BEGUELIN, in 1773, endeavoured to prove, that the variation of the whole mass of the atmosphere, as well as that of the spring or elasticity in a part of this mass, are the two general causes of the variations of the barometer; and that the primitive causes of this remarkable effect are, *heat, cold, dryness* and *moisture*, with their different combinations.

We cannot enter into the particulars relative to the operation of these various causes, but shall briefly observe, that *heat* dilates the air; *cold* contracts it, and draws together those parts which it is the property of heat to separate: hence, the natural effect of the former is expansion; the consequences of the latter, condensation, compression of its spring, and an increase of pressure, on account of which, the mercury rises in the barometer.

Respecting the effects of *dryness* and *moisture*, it deserves to be remarked, that, if the latter diminishes the pressure of the air, by relaxing its spring, it on the other hand loads it with watery particles, which very considerably augment its mass, so that it may be difficult to determine how far the moisture of the air exerts its influence on the rise and fall of the barometer. The same observation may be applied to dryness, which dispels the watery particles that increased the weight of the air; so that there appears to be a perpetual conflict between the effect of *spring* and *mass*, between *elasticity* and *weight*; and experience alone can inform us whether, in this contest of the elements, the effect of elasticity is much superior to that of weight. Such is the plausible explanation of BEGUELIN, and we have only to regret, that the result of his inquiries, still leaves the subject involved in much doubt and difficulty, because even this theory does

not account for the *sudden* changes of the atmosphere

Nevertheless, experience has furnished us with a sufficient number of facts, from which we may, with tolerable precision, ascertain the present, and predict the future state of the surrounding element, by the *practical* use of the barometer. Thus, 1 The rising of the quicksilver *generally* presages fair weather, as its falling does the contrary, or rain, snow, high winds, and storms; 2. In very *hot* weather, the sudden falling of the mercury portends thunder; 3 In *winter*, the rising indicates frost; and in frosty weather, if the mercury falls three or four divisions, there will certainly follow a thaw; but if it rise in a continued frost, it will always be accompanied with snow; 4 When foul weather quickly succeeds after the falling of the mercury, it will not be of long duration; nor are we to expect a continuance of fair weather, when it soon succeeds the rise of the quicksilver; 5. If, in foul weather, the mercury happens to ascend considerably, and continues in an advancing state for two or three days successively, then we may expect also a continuance of fair weather. 6. If, in clear weather, the mercury falls remarkably for two or three days together, before the rain sets in, it is then highly probable that it will be succeeded by much rain, and perhaps high winds; 7 The unsettled motion of the mercury indicates changeable weather To these remarks, Mr CAPPER adds, that when the barometer suddenly falls two or three-tenths, without any material alteration in the thermometer, and the hygrometer is not much turned towards moist, a violent gale of wind may be expected. When the hygrometer inclines far towards moist, with only a trifling descent in the barometer, it denotes a passing shower and little wind; and when the barometer falls considerably, and the hygrometer turns much towards moist, the thermometer remaining stationary, and rather inclined to rise than fall, both violent wind and rain are likely to follow, in the course of a few hours. 8. Respecting the words engraved on the register plate, they cannot be strictly relied upon to correspond exactly with the state of the weather; though it will in general agree with them as to the mercury *rising* and *falling*. These words deserve to be particularly noticed when the mercury removes from "Changeable" upwards, as those of the lower part should be adverted to, when the quicksilver falls from "Changeable" downwards. In other cases, they are of no use; for as its rising in any part forebodes a tendency to fair, and its falling to foul weather, it follows, that though it descend in the tube from *Settled* to *Fair*, it may nevertheless be attended with a little rain; and when it rises from the words "Much Rain" to "Rain," it shews only an inclination to become fair, though the wet weather may still continue in a less considerable degree than it was when the mercury began to rise. But if the mercury, after having fallen to "Much Rain," should ascend to "Changeable;" it predicts fair weather, though of a shorter continuance than if the quicksilver had risen still higher; and so, on the contrary, if the mercury stood at "Fair," and descends to "Changeable," it presages foul weather, though not of such duration, as if it had fallen lower.

These observations are founded on experience, and we are indebted for them chiefly to Mr PATRICK, who has investigated this subject with considerable precision. It appears from the result of these facts, that the height of the mercury is not the principal criterion for ascertaining the probable changes of the weather, but rather the relative motion of that fluid in the tube. Hence, to enable us to judge rightly of the impending variations, we ought to possess a correct knowledge, whether the mercury is actually rising or falling For this purpose, the following rules, stated by Mr ROWING, may be of advantage: 2 If the surface of the mercury be convex, standing higher in the middle of the tube than at the sides, it generally indicates the rising of this fluid metal, 2 If its surface be concave, it is then sinking; 3. If it appear level, it is stationary; 4 If, after shaking the tube of a *small* glass, the mercury rises about half a tenth of an inch higher than it stood before, it is a proof that the air has become heavier, but if it sink as much, it follows that the atmosphere is lighter. Hence, in making observations on the weather, such a glass should always be previously shaken; because the metal which adheres to the sides of the tube, prevents its free motion, till disengaged a slight agitation of the instrument [illegible]ese phenomena are peculiar to places situated at a distance from the equator, and, therefore, deserve to be attended to in *our* climate. on the contrary, at

St. Helena, they would be of little or no service; for, according to the accurate observations of Dr. Halley, made in that island, the mercury remained stationary in all weathers. This judicious naturalist has furnished us with the following curious account of these phenomena, and their causes; of which we shall give a concise abstract: 1. In calm weather, when there is a prospect of rain, the mercury is commonly low; 2. In serene and settled weather it is generally high; 3. On the approach of tempestuous winds, though unaccompanied with rain, the mercury sinks lower than on any other occasion; 4. The greatest height of the mercury is observable during the prevalence of easterly or north-easterly winds; 5. In calm, frosty weather, the quicksilver generally stands high; 6. After very great tempests, when the mercury has been very low, it generally again quickly ascends; 7. The barometer in the northern regions exhibits greater variations than in those lying more towards the south; 8. Within and near the tropics, there is little or no alteration in the mercury, as before observed. Hence Dr. Halley is of opinion, that the principal cause of the rise and the fall of the quicksilver must be attributed partly to the variable winds in the temperate zone, the great inconstancy of which, in Britain, is well known; and partly to the uncertain exhalation and precipitation of the vapours floating in the atmosphere, which is at one time more saturated than at another, and consequently heavier; though the precipitation of aqueous vapours chiefly depends on the previous degree of evaporation.

Our plan does not permit us to accompany these propositions with the explanations given by Dr. Halley; and as the theoretical part has been strongly contested by other philosophers, though not refuted, till the late Dr. Black, of Edinburgh, endeavoured to prove the fallacy of all preceding theories, we shall conclude this subject with a summary outline of his doctrine.

According to Dr Black, 1. Vapour is formed by an intimate union between fire and water, by which the *fire*, or *heat*, is so totally enveloped, and its action so entirely suspended by watery particles, that it loses its properties of giving light and heat, and consequently is in a *latent state*; 2 If the atmosphere is affected by any unusual degree of heat, it becomes incapable of supporting a column of mercury so long as before; for which reason that in the barometer sinks. From these preliminary axioms it follows, that as vapour is formed by the union of fire and water, or the solution of the latter in the former, it is impossible that the vapour can be condensed, until this union or solution be effected. The beginning of the condensation of the vapour, then, or the first symptoms of approaching rain, must be the separation of the fire, which lies hidden or involved in the vapour. This may at first be slow and partial, or it may be sudden and violent: in the former case, the rain may come on slowly, and after considerable intervals; in the latter, it will be quick, and in a large quantity. With regard to the effect of this separation between the fire and water, we shall only observe, that as it is gradual and slow, the barometer may indicate rain for a considerable time before it appears: or if the sensible heat communicated from the vapour to the atmosphere, should be absorbed by the colder parts, or be carried off by any unknown means, or prevented from affecting the specific gravity of the air, the barometer will undergo no change, and yet the vapour, being deprived of the heat necessary to sustain it, must descend in rain; and thus it happens, that the indications of the barometer do not always hold true, respecting the changes of the weather. Hence, also, it appears, that though the specific gravity of the air is diminished, unless that diminution proceed from a discharge of the *latent* heat contained in the vapours, no rain will follow; and thus the sinking of the barometer may prognosticate wind as well as rain, or sometimes no change whatever.

Such is the ingenious theory of Dr. Black, who certainly has produced the most philosophic explanation yet offered on this apparently intricate subject, and though his reasoning may not enable us to solve all the difficulties occuring in meteorological investigations, we do not hesitate to say, that it has placed the nature and causes of these phenomena in the clearest point of view, as far as it is possible to account for them, in the present state of physical science. We shall, therefore, conclude with observing, that though the *wind* is certainly not the sole cause of raising and depressing the mercury, yet, in our climate, it has a remarkable influence on the state of the barometer. For, if the mercury falls, when the wind blows from those quarters which gene-

cally are productive of much rain, such as the *south* and *south-west* winds are in the environs of London, there is no doubt but wet weather will speedily follow; on the contrary, if the quicksilver rises, while the wind blows from dry quarters, such as the *northerly* and *easterly* regions are to Britain, then it is highly probable that the weather will become fair. But if the mercury rises during a southerly wind, or falls while it blows from the north; in both cases the prognostics are extremely doubtful, as it frequently happens, that the weather does not correspond to the temporary rising and falling of the quicksilver.

The mercury in the barometer is not only influenced in its height by the increased or diminished density of the air, but also by the heat of the atmosphere. The amount of dilatation that takes place in the column from the freezing point to boiling water, is only five lines. This was proved by Mr. Peter Legaux, in July, 1781, by experiments made before the Commissioners of the *Academy of Sciences* at Paris.

At the same time that the increase of the height of the mercury is taking place, the specific gravity of the metal is also diminished It has been found by experiments, that the volume of mercury condensed by the cold of ice, is to a volume of mercury rarefied by the heat of boiling water as 66 to 67, that is to say, that the augmentation of the volume of the mercury, or what is the same thing, the diminution of its specific gravity, is a 66th, counting from the freezing point to that of boiling water. So that a barometer in passing from the cold of ice to the heat of boiling water, would rise to a quantity equal to the 66th part of its height, without any change having taken place in the pressure of the atmosphere Five lines are then the amount of the utmost possible dilatation of the column of mercury by heat. Five multiplied by 16 gives 80; and as the scale of REAUMUR's thermometer from the point at which water freezes, to that of boiling water, is divided into 80 degrees, it is obvious that there is a perfect connexion between these two instruments, so that one may be used to correct the other. It will then be necessary to deduct one-sixteenth of a line from the height of the barometer, for every degree that the thermometer rises above the freezing point, and to add one-sixteenth to its height when the thermometer marks degrees below the cypher.

Before taking an observation of the barometer, it is necessary to make the mercury move up and down once or twice, to put it in equilibrium with the air, and to destroy all adhesion it may have with the sides of the glass. The surface of the reservoir must then be brought to the line of the level, by means of the screw adapted for the purpose to the bottom of the instrument; because the column of mercury cannot rise or fall without impressing a contrary effect upon the surface of the mercury contained in the reservoir.

These remarks are of infinite consequence to all who wish to make accurate barometrical observations: and for want of knowing their consequence, the greater part of those which have been published in America are nearly useless.

For a very interesting paper on the barometer, the reader is referred to a volume of essays by Mr. JOHN DALTON *of Manchester*, 1793.

A very curious new phenomenon deserves to be mentioned, concerning the state of this instrument, on particular occasions, M. SCHMIDT, Professor of Mathematics at Pforte, in Germany, lately observed that his barometer became luminous in the day-time, while the horizon was covered with thunder-clouds; and that on the approach of a tempest, there appeared on the surface of the mercury, a small and distinct luminous globe, which could be perceived in day-light, at the distance of several yards. We relate this singular fact; and, not being in possession of farther particulars, we can only conjecture, that such a phenomenon may perhaps be ascribed to the greater rarefaction and electricity of the air, in the serene climate of Germany, previous to the explosion of thunder; and likewise to a more phosphorescent nature of the mercury; a property which it doubtless acquires when submitted to the repeated process of distillation, and other means of purifying that peculiar metallic fluid.

[BAROMETERS are also used to measure the heights of mountains: for the higher the mountain the shorter is the column of atmosphere, and the less is the quantity of mercury it will support. Professor PLAYFAIR proposes for this purpose a barometer made of an iron tube ¼ of an inch diameter, of even measure throughout within side. On inverting it, more mercury will fall into the receiving cup, in proportion to the height ascended. By stopping

the tube with the finger, inverting it, and measuring the quantity of mercury in the basin, you have a datum for the height.—T C]

BAROMETER, *Leech worm* The following changes have been observed in this animal before any particular alteration of the weather

1 When the leech lies motionless at the bottom of the phial, and is frequently in a spiral form, the weather in summer, will be serene and beautiful, the same denotes clear frosty weather in winter

2. If it creeps up to the top of its lodging, it will rain within twenty four hours in summer, and snow in winter

3 When the leech gallops through its limpid habitation with swiftness, it denotes wind, and seldom rests until it blows hard

4 When the leech lodges almost constantly out of the water, and discovers uncommon uneasiness in violent throes and convulsive-like motions, a storm of thunder and rain will succeed

As many curious readers may be induced to make further observations on this insect, we have subjoined the mode of making the leech weather glass, and directions for keeping them, but would suggest the propriety of substituting *hydrant* for the spring water recommended in the directions

Put a few leeches into an eight ounce phial, two thirds full of *spring water*, with some fine sand or moss at the bottom As the leeches have no other evacuation but through the pores of the skin, which passes from them in perspirable matter and adheres to the body in the state of slime, which if not timely removed prevents these evacuations and causes the death of the worm, the use of the sand or moss is that it may rub the slime off its body, which afterwards floats in the water Over the top of the phial tie a piece of bladder picked full of holes to admit the air.

The water must be changed once a week, or oftener in the summer, sometimes it is necessary, when there is a great change of temperature between the water and that contained in the phial, only to put half or two thirds of the fresh to the other Leeches should be kept in a cool situation in summer, and a rather warm one in winter

The leeches to be used for the purpose above mentioned should be very carefully taken, as any injury they may sustain, prevents the natural influence of the weather upon them, and will consequently defeat the experiment. See also SPIDER

BARREL, in commerce, is a vessel of an oblong size, made of wood, the form of which is generally known, as well as its use for holding various sorts of merchandise, it is also used as a measure for liquids

The English barrel, wine measure, contains the eighth part of a tun, the fourth part of a pipe, and one half of a hogshead, or 31½ gallons A barrel of beer should contain 36, and one of ale 32 gallons The barrel of beer, vinegar, or liquor preparing for vinegar, ought to contain 34 gallons, according to the standard of the ale quart

Barrel is also used to denote a certain weight of merchandises, and which differs according to various commodities A barrel of Essex butter weighs 106 pounds and of Suffolk butter 256 pounds The barrel of herrings ought to contain 32 gallons, wine measure, which amount to about 28 gallons, old standard, and consists of about 1000 herrings The barrel of salmon ought to contain 42 gallons, and a barrel of eels the same quantity The barrel of soap must weigh 256 pounds The Pennsylvania barrel of flour contains 196 lbs

BARROWS, in ancient topography, artificial hillocks or mounts, met with in many parts of the world, and which, on being opened, are found to be repositories of the dead When these mounts are composed of stones, they are usually distinguished by the name of *cairns*

BARYTES, a very heavy mineral, common in many countries, especially in lead and copper-mines Formerly from its great weight it obtained the name of ponderous spar It exhibits, when pure, the following properties. It has a sharp taste, changes vegetable blues to green, serves as an intermedium between oil and water, and in these respects it bears a strong resemblance to alkalies when pure, it is infusible it is near four times heavier than water It will not unite with the alkalies [It is probably a metallic oxyde —T C]

BASALTES, in natural history, a hard stone of a black, grey, or sometimes greenish colour, and on account of its constituent parts, and resemblance to *lava*, generally classed among the volcanic productions Its specific gravity is to that of water, as three to

one. The component parts of basaltes are in the following proportion: siliceous earth 50, argillaceous 15, calcareous 8, magnesia 2, and iron 25. It is remarkable, that this fossil is disposed either in solid or jointed columns; the former consisting of five or six pillars, either of an uniform size, or conical, and generally standing close to each other perpendicularly, of different and sometimes equal length, as if they had been arranged by a skilful artist. The Hebridic island of Staffa is entirely composed of lofty and capacious basaltic columns, the most curious arrangement of which, perhaps on the whole globe, is the celebrated Fingal's cave. In Germany, also, there are several basaltic mountains; for instance, those on the Rhine, and near Freyberg, in Saxony, where Basaltes is frequently found of an oval or spherical figure. Spain, Russia, Poland, and Silesia, also produce various basaltic rocks. Great quantities of this fossil are deposited in the neighbourhood of Mount Etna, in Sicily; of Hecla, in Iceland, &c. But the largest mass yet discovered, is, what is called the Giant's Causeway, in Ireland.

As naturalists differ in their opinion concerning the origin of this curious substance, whether it be the production of volcanoes arising from subterraneous fires, or derive its origin from crystallisation by water, we shall state only the result of M. Bergmann's inquiry into this subject, as his explanation appears to be conclusive. He asserts, that both fire and water contribute to form basaltes, and it cannot be doubted that there has been some connexion between the basaltic pillars and subterraneous fire, as they are found mixed with lava, and other substances, produced by that element.

[M. Cordier has lately found that the composition of lavas and basaltes is the same. Basaltes is to be found at the falls of Pasaick in New York state, and at Holyoke in Massachusetts, having strong marks of volcanic origin.—T C.]

Uses—Basaltes is an excellent material for building houses, and paving streets: it is also employed by lapidaries and statuaries for various productions of art; as well as by artists working in gold and silver, for touch or test-stones. Gold-beaters and bookbinders, on the continent, make their anvils of this firm and massy stone; which is also used as an ingredient in the manufacture of glass, especially for producing the common window-glass, and green bottles.

BASE, in chemistry, a term used to denote the earth, the alkali, or the metal of which a salt is formed in union with oxygen: thus, in the oxyde of iron or copper, the iron or copper is the base.

Base, in architecture, is used for any body which bears another, but particularly for the lower part of a column and pedestal. The base of columns is differently formed in different orders: thus, the Tuscan base consists only of a single torus, besides the plinth: the Doric has an astragal more than the Tuscan: the Ionic has a large torus over two slender scotias, separated by two astragals: the Corinthian has two toruses, two scotias, and two astragals: the Composite has an astragal less than the Corinthian: the Attic base has two toruses and a scotia, and is proper for either the Ionic or Composite columns.

BASHAW, a dignity under the Turkish government. *Bashaw*, used absolutely, denotes the prime vizier; other bashaws, which are generally governors of provinces or cities, being distinguished by the name of the place under their command. The appellation is given by way of courtesy to almost every person of any figure at the Grand Signior's court.

BASILICON OINTMENT, in pharmacy, a preparation consisting of eight parts of hog's lard; five of white resin; and two of yellow wax: or, according to the London College, of nearly equal parts of yellow resin, bees wax, and olive oil. The former ingredients, prescribed by the Edinburgh College, are cheaper and equally efficacious.

This ointment is generally employed in the dressing of wounds and ulcers, for digesting and cleansing them, as well as for promoting their cicatrisation.

BASILISC, in zoology, the trivial name of a species of lizard.

Basilisc, a fabulous kind of serpent. Kirchmayer and Van der Wiel have given the history of the basilisc, and detected the folly and imposture of the traditions concerning it. In some apothecaries' shops there are little dead animals shewn, which are said to be basiliscs: but these appear to be a kind of bird, almost like a cock, but without feathers: its head is lofty, its wings are almost like a bat's, its eyes large, and its neck very short. As to those shown and sold at Venice, and in other

places, they are only thornbacks, artificially put into a form like that of a young cock, by stretching out their fins, and furnishing them with a little head and hollow eyes

BASKET, a well-known utensil, made of twigs interwoven together. Considered as a measure in commerce, it denotes an uncertain quantity, as a basket of medlars is two bushels, of asafœtida from 20 to 50 pounds weight, &c. The ancient Britons were celebrated for their ingenuity in manufacturing baskets of very elegant workmanship, which they exported in large quantities.

Basket-salt is made from the water of the salt springs in Cheshire, and other places. It differs from the common brine salt, in the fineness of the grain, as well as on account of its whiteness and purity In preparing the former kind, some persons use *resin* and other ingredients, for separating the crystals, and reducing them to a smaller grain; others effect this by keeping up a brisk fire under the pans, and constantly stirring the salt; but the most approved method of manufacturing basket-salt is, to take out for this purpose, the third draught of every pan which is working for the common brine salt: and to do this before the granules or crystals are perfectly formed. Thus the salt will become very fine: and it is then hard pressed into small wicker-baskets, dried at the stove and kept for sale.

BASS, the lowest in the four parts of music. Of all the parts, this is the most important; and it is upon this that the chords proper to constitute a particular harmony are determined. Hence the maxim among musicians, that when the bass is properly formed, the harmony can scarcely be bad.

BASSE, a sea-fish somewhat resembling a perch, with a short and sharp spine on the posterior plate of the gill-cover, fourteen fins to the second dorsal fin, the back dusky tinged with blue, and the belly white.

This fish sometimes attains the weight of twenty and even thirty pounds.

It is found in the Mediterranean, the British Channel, the Atlantic and Northern Oceans, and the Baltic.

These voracious fish are caught during nearly all the year; but the months of August, September, and October, are considered most favourable for taking them. They not only approach the shores, but even ascend the rivers to great distances. Though their flesh is in general woolly and insipid, the Romans preferred them to many other kinds of fish, and sometimes paid high prices for them. Those which they chiefly esteemed were caught in the Tiber, betwixt the bridges of Rome.

The eggs or *roes* of the basse have sometimes been used in France and Italy to make what is called *Boutargue* or *Botargo*.

BASSO-RELIEVO, or low-relief, is opposed to *alto-relievo*, or high-relief. Basso-relievo is a piece of sculpture where the figures or images do not protuberate far beyond the body on which they are formed.

BASTILE, denotes a small castle, fortified with turrets. Such was the Bastile of Paris, which was the last castle that retained that name, This was begun to be built in 1339, by order of Charles V. and finished in 1383, under the reign of his successor. It was used as a state prison; and, in its administration, appears to have been a political inquisition.

Formerly, the Bastile was never mentioned in England unaccompanied by expressions of abhorrence: but recent circumstances have gained it so many friends on the one hand, and so many enemies on the other, that a plodding lexicographer may scarcely venture to repeat the information that he can obtain from any source whatever. Every report is to be suspected. In the *Supplement to the Encyclopedia Britannica*, however, it is said that, the Bastile being considered as an engine of the ordinary police, not only the ministers of state, not only the magistrates, but every clerk, and even inferior officer, had it in his power to procure the confinement of any individual he pleased within the walls of that prison. If this information be correct, no other evidence can be necessary to furnish a true estimate of the Bastile. It might be easy to argue the utility of intrusting to the hands of government authority to confine those whom it may know to be dangerous to its existence, but that the hands thus intrusted, should so far betray the confidence reposed, as to permit "every petty pelting officer" to wield its sacred thunder, is a circumstance so palpably scandalous as almost to exceed belief. The Bastile in Paris was demolished on July, 14th, 1789.

BASTION, in modern fortification, a huge mass of earth, usually faced with sods, but sometimes with brick, and,

in a few instances, with stone, standing out from a rampart, whereof, it is a principal part, and what, in ancient fortification, was called a bulwark

BAT, or *Vespertilio*, an animal which seems to fill up the chasm between quadrupeds and birds; with the latter, however, it has in common only the power of flying, as Nature has provided it with a smooth gause-like web, serving the purpose of wings.

There are twenty-eight species of this animal The common bat is nearly the size of a mouse, and flies about, in quest of moths and other insects, in fine summer evenings, with a rapid and irregular motion, resembling that of a butterfly. When it alights on the ground, it is unable to fly again, till it has crawled to some height. It remains torpid during the winter in some subterraneous retreat, revives in the beginning of spring, and the female brings forth from two to five young at a time, which it suckles like other mamillary animals.

As the bats of our climate are frequently troublesome, by infesting chimnies, and annoying the neighbourhood of dwellings, we shall communicate a method of destroying them, nearly in the words of the *Encyclopedia Britannica*. Take the flower-cups of burdock, whiten them with chalk, and throw them up into the way of their flight: thus attracted by the whiteness of the substance, the bats injure their membraneous wings by the hooks of the bur, and fall to the ground.

In our opinion, these animals are more useful than injurious; as they devour a multitude of insects; though they likewise prey upon bacon, and other animal food suspended in chimnies. But having very formidable natural enemies in the owls, which chase them into hollow trees and obscure holes of walls, there will be little occasion for persecuting them with the burdock.

BATH, in the general acceptation of the term, signifies a convenient receptacle of water adapted to the various purposes of washing or cleansing, and bracing the body, either by plunging, or continuing in it for a certain time.

Baths may be divided into *cold, cool, warm*, and *hot;* and these again into natural and artificial.

In order to treat this interesting subject systematically, we shall consider it according to the division above-mentioned.

Cold Baths are those of a temperature varying from the 33d to the 56th degree of Fahrenheit's thermometer. The general properties of the cold bath consist in its power of contracting the animal fibres, while it dissipates the *caloric* (or matter of heat) that exists between their interstices, and thus effects a greater approximation of the particles, which were before dilated and relaxed by heat. That such is the natural influence of cold, cannot be doubted; and hence this species of bath, by its powerful action on the whole system, is one of the most important medicinal remedies presented by the hand, and, as it were, supplied by the very bosom of Nature

Even in the most remote times, cold bathing was resorted to, with obvious advantage, by nervous and debilitated persons; but in the dark or middle ages, this genuine source of health was totally neglected, till the good sense of Europeans again adopted it as a general restorative, when the prevailing diseases of relaxation and atony rendered the use of such a remedy inestimable.

The superior advantages of cold bathing over all internal *corroborants*, consists chiefly in its immediate salutary action on the solids, without the intervention of the organs of digestion and nutrition; without having to perform a passage through numerous channels, before it can exert its efficacy. For this obvious reason, it is peculiarly adapted to those constitutions which, though robust, and apparently healthy, are liable to nervous, hysteric, hypochondrial, and paralytic affections, as well as to frequent attacks of flatulency and consequent indigestion.

Without expatiating, either on the history, or the sensible effects of the *Cold Bath*, we shall proceed:

I. To a general enumeration of those cases, in which it cannot be resorted to with advantage and safety.

II. To lay down the necessary rules and directions for the use of this *heroic* remedy.

With respect to the former, we must be concise, and shall chiefly point out by *negative* propositions, those particular states of the body, in which *cold* bathing must *not* be attempted: namely, 1 In a full habit of body, or what is called general *plethora*, on account of the frequent febrile disposition attending such individuals; 2 In hemorrhages or fluxes of blood, open wounds or ulcers, and every kind of inflamma-

tion, whether external or internal, 3 In obstructions of the intestines, or habitual costiveness, 4 In affections of the breast and lungs, such as difficult respiration short and dry coughs, &c 5 When the whole mass of the fluids appears to be vitiated, or tainted with a peculiar acrimony, which cannot be easily defined, but is obvious from a sallow colour of the face, slow healing of the flesh when cut or bruised, and from a scorbutic tendency of the whole body, 6 In gouty and rheumatic paroxysms, though Sir JOHN FLOYER asserts, that "*Podagries* sometimes have kept their fits off with it," 7 In cutaneous eruptions, which tend to promote a critical discharge of humours by the pores (yet the celebrated physician just mentioned, informs us, that great cures have been effected in the *leprosy*, by bathing in what he calls, "Cold Sulphur Water") 8 During pregnancy, and 9 In a distorted or deformed state of the body, except in particular cases to be ascertained by professional men Sir JOHN farther recommends, but too indiscriminately, the dipping of ricketty children one year old, every morning in cold water, and he is of opinion that, in adults, it prevents the infection of fevers, by making the body less sensible of the changes of air that, in old women, it stops violent hemorrhages from the uterus, that it has contributed to cure canine madness, poisonous bites of animals, and obstinate agues, by going in previously to the return of the fit, and after all the evacuations of the body have been properly attended to, and, lastly, that the *Sea water Bath* has been of eminent service in dropsies and defective hearing in which last case he knew a deaf person who could hear perfectly well, on the day he bathed in the sea

Experience, however, has but too often evinced, that this excellent remedy, whether by fresh or salt water, cannot be implicitly relied upon in those complaints, nor will it be productive of any good effects, unless our conduct, in general, be accommodated to the following rules

1 It is a vulgar error, that it is safer to enter the water when the body is *cool* and that persons heated by exercise, and beginning to perspire, should wait till they are perfectly cooled Thus, by plunging into it, in this state, an alarming and dangerous chilliness frequently seizes them and the injury sustained is generally ascribed to their going into it too warm; while it doubtless arises from the contrary practice Dr J CURRIE, of Liverpool, in his valuable "*Treatise on the Effects of Water in Fevers*" says, with equal truth and precision, that "in the earliest stages of exercise, before profuse perspiration has dissipated the heat, and fatigue debilitated the living power, nothing is more safe, according to my experience, than the cold bath This is so true, that I have, for some years, constantly directed infirm persons to use such a degree of exercise, before immersion, as may produce some increased action of the vascular system, with some increase of heat, and thus secure a force of re action under the shock, which otherwise might not always take place But, though it be perfectly safe to go into the cold bath in the earlier stages of exercise, nothing is more dangerous than this practice, after exercise has produced perspiration, or terminated in languor and fatigue, because in such circumstances the heat is not only sinking rapidly, but the system parts more easily with the portion that remains" In short, it is a rule liable to no exception, that *moderate* exercise ought always to precede cold bathing, to promote the re action of all the vessels and muscles, on entering the water, for neither previous rest, nor exercise to a violent degree, are proper on this occasion

2 The duration of every cold bathing applied to the whole body, ought to be short, and must be determined by the bodily constitution, and the sensations of the individual, for healthy persons may continue in it much longer than valetudinarians, and both will be influenced by the temperature of the air, so that in summer they can enjoy it for an hour when, in spring or autumn, one or two minutes may be sufficient Under similar circumstances, cold water acts on aged and lean persons with more violence than on the young and corpulent hence the former, even in the hottest days of summer, can seldom with safety remain in the bath longer than a quarter of an hour, while the latter are generally able to sustain its impression for double that time

3 The head should first come in contact with the water, either by immersion, pouring water upon it or covering it for a minute with a wet cloth, and then diving head foremost into the water

4. As the immersion will be less felt when it is effected suddenly; and as it is of consequence that the first impression should be uniform over the body, we must not enter the bath slowly or timorously, but with a degree of boldness. A contrary method would be dangerous; as it might propel the blood from the lower to the upper parts of the body, and thus occasion a fit of apoplexy. For these reasons, the *shower bath* is attended with considerable advantages, because it transmits the water quickly over the whole body; and, consequently, is more consistent with the rules before-mentioned.

5. The morning is the most proper time for using the cold bath, unless it be in a river; in which case, the afternoon, or from one to two hours before sun-set, will be more eligible; as the water has then acquired additional warmth from the rays of the sun, and the immersion will not interfere with digestion: on the whole, *one* hour after a light breakfast, or *two* hours before, or *four* hours after dinner, are the best periods of the day, for this purpose.

6 While the bather is in the water, he should not remain inactive, but apply brisk general friction, and move his arms and legs, to promote the circulation of the fluids from the heart to the extremities. It would, therefore, be extremely imprudent to continue in the water till a second chillness attacks the body; a circumstance which would not only defeat the whole purpose intended, but might at the same time be productive of the most injurious effects.

Immediately after the person leaves the bath, it will be necessary for him, with the assistance of another person for despatch, to wipe and dry his body with a coarse and clean cloth He should not afterwards sit inactive, or enter a carriage, unless warmly clothed and wearing flannel next the skin: if season and circumstances permit, it will be more proper, and highly beneficial, to take gentle exercise till the equilibrium of the circulation be restored, and the vessels as well as the muscles, have acquired a due degree of re-action.

The best place for cold bathing is in the invigorating water of the sea, or a clear river; and where neither of these can be conveniently resorted to, we recommend the SHOWER BATH; an apparatus which may be procured from the tin-man. Its effects are doubtless more powerful than those of the common bath: and though the latter covers the surface of the body more uniformly, yet this circumstance by no means detracts from the excellence of the former; because those intermediate parts, which the water has not touched, receive an electric and sympathetic impression, in a degree similar to those brought into actual contact. As every drop of water from the shower bath operates as a partial cold bath, its vivifying shock to robust individuals, is more extensive and beneficial, than from any other method of bathing.

Hence this bath is possessed of the following important advantages; 1. The sudden contact of the water may be repeated, prolonged, and modified, at pleasure; 2. The head and breast are tolerably secure, as it descends towards the lower extremities: thus, the circulation is not impeded, breathing is less affected, and a determination of blood to the head and breast is effectually obviated; 3. As the water descends in single drops, it is more stimulating and pleasant, than the usual immersion; and can be more readily procured and adapted to circumstances; lastly, 4. The degree of pressure from the weight of water, is here likewise in a great measure prevented; nor is the circulation of the fluids interrupted so as to render the use of this bath in any degree dangerous; a circumstance of the highest importance; because by the ordinary immersion, persons are often exposed to injuries which they least apprehended

Cold bathing produces the best effects when used early in the morning; and when, after wiping the body dry, moderate exercise is afterwards taken. The evening is certainly not the best time to use the cold bath in the city; several cases having occurred within the Editor's observation, of violent fevers in persons who tried this experiment in the months of August and September. Bathing in salt water every morning is said to preserve strangers from the dangerous seasoning fevers of the West Indies; but in this case temperance must also be joined, and is probably more certain in its effects than any other remedy. The cold bath is highly useful to preserve children from the bowel complaints which prevail in the summer throughout the United States.

As the erection of public baths has, from the remotest ages, been considered an object worthy of national atten

tion, and private solicitude, we have selected a modern specimen of such a structure as, in our opinion, will be admired, and perhaps adopted in this country, where public spirit, and a cordial support of every useful invention, are equally conspicuous We allude to the FLOATING BATHS at HAMBURGH, an establishment which owes its origin to the enlightened members of the "*Society for the Encouragement of Arts and Useful Trades*," founded in that city, in the year 1765

These baths were projected by Dr MOLDENHAWER physician at Hamburgh, and erected by public subscription, on a small lake of fresh water, called the *Alster* M ARENS, an eminent architect of the same city, delineated the plan of the building, which we are informed, is an improvement on similar baths established in the principal towns of France

Although we have not had an opportunity of comparing the *internal* construction of the Hamburgh baths, with those floating on the river Thames, near Westminster bridge, yet we have reason to believe that they are essentially different from any other existing in this country Induced by this consideration, and convinced of the intrinsic advantages which the former possess, independent of their beautiful external appearance, we have caused accurate representations to be copied from the original plates transmitted to us from Hamburgh, with this difference only, that ours are upon a reduced scale

Explanation of the Plates representing the Floating Baths erected in the City of Hamburgh.

PLATE I.

A—Elevation of the longitudinal front of the Floating Bath, with its ornamental entrance, of the surrounding gallery, and the tents expanded over the bathing machines, and covered with sail-cloth, which have been four times varnished The wooden roof is also covered with strong sail cloth, which had been repeatedly coated with tar The whole vessel is 80 feet in length, and 40 in breadth

B—Elevation of the transverse sides of the Floating Bath, with its glass doors and windows, through the former of which, the corridor, and through the latter, the cabins on each side receive their light.

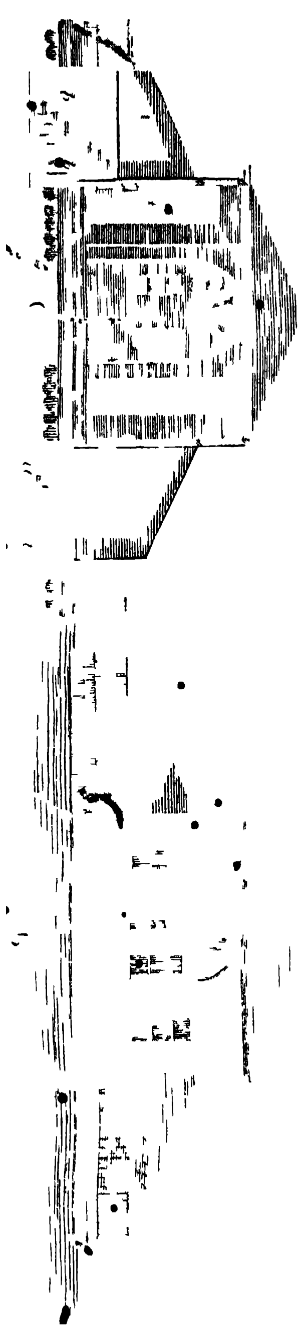
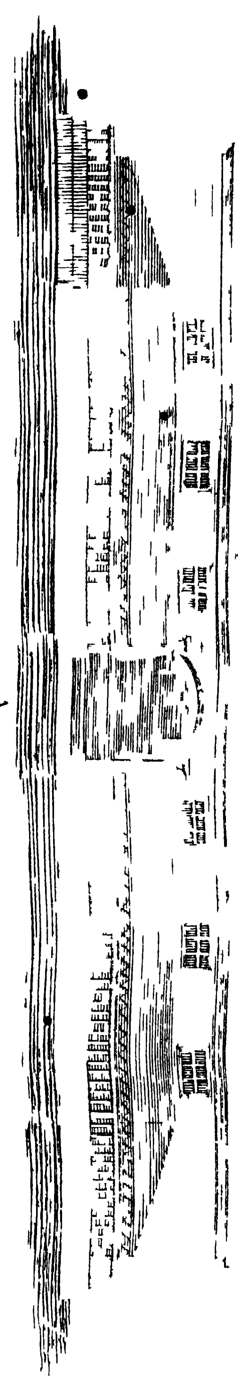
C—Section of the building namely, *a b*, of the *Bathing Machines*; and *c, c*, of the chambers for undressing and dressing On each longitudinal side of the vessel, there are (as appears on inspecting Plate II) six of these *chambers*, which may be easily opened from within, and on each transverse side are two *lateral cabins*, partly furnished, and partly designed for store rooms, to hold various implements

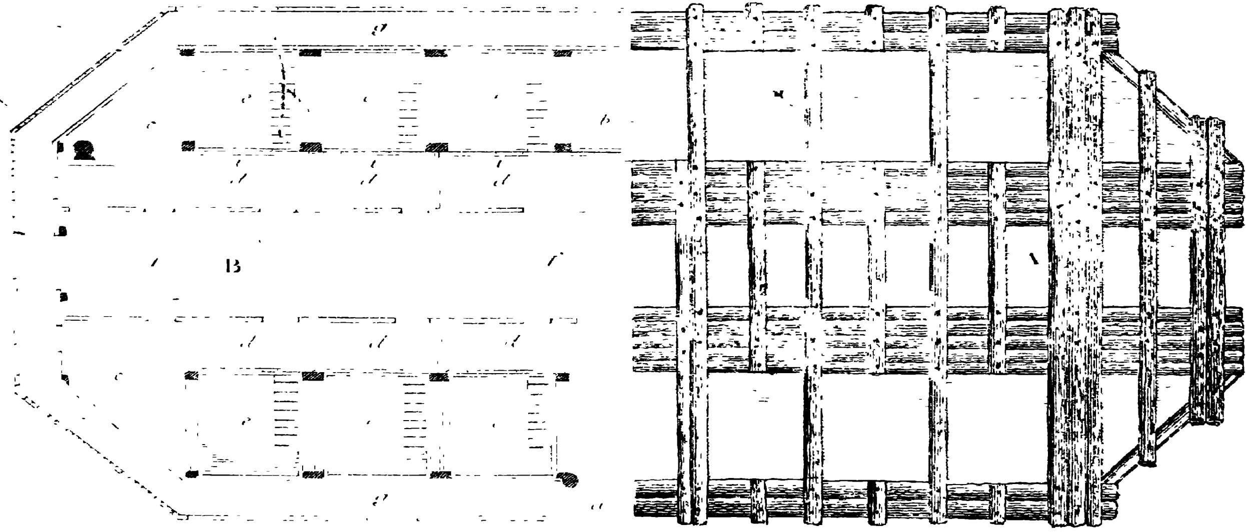
The corridor, extending from one side door to the other, within the centre of the building (See Plate II *B f*) is seven feet and a half wide, and on each side are the bathing machines and chambers.

These *chambers* for undressing and dressing, which are provided with sky-lights, and marked *c*, are seven feet and a half in length, and four feet wide. They are anti chambers to the bathing machines *a, b*, and each of the former contains the most necessary articles of furniture, such as a table, chair, looking glass, cork-couch (for supporting the feet till they are dried, after coming from the bath), pegs, for suspending clothes, a boot jack, &c

The bathing machines *a, b*, below the surface of the water, consists of four sides, made of laths two inches thick, through which it flows, and they are provided with a solid wooden floor, secured by iron staples These machines are six feet broad and seven long, so that the whole body may move in them without constraint

Their construction renders them moveable, so that they may be raised or lowered at pleasure, and with little trouble, as appears from the machine *b*, while the impurities settled at the bottom may be easily removed At the side of the steps (See Plate II *h*), which extend to the bottom of the bathing machine, the latter is provided with a ballustер (Plate II *i*), adjacent to which is placed a table and chair The bathing machines are adapted to different depths of water, so that every individual may regulate them at 2½, 3, 3½ or 4 feet in depth, and these proportions are marked within the chamber Above each machine are suspended two strings, one of which is connected with a bell fixed in the corridor, for calling the waiter by means of the other, the bathing person may exclude the current of air circulating between the bottom of the floating vessel and the surface of the water, as there is a board which slides down for that purpose



Floating Baths at Hamburgh

PLATE II.

A—Represents the construction of the floating vessel, which serves for the foundation of the building. It consists of strong double fir-beams, connected with each other by iron bolts and staples.

B—Represents the *ground-plan* of one half of the floating vessel: *a*, the entrance: *b*, a room on the opposite side for the waiter, who is appointed to receive and deliver the admission tickets, &c.; *c*, the lateral cabins; *d*, the undressing and dressing chambers; *e*, the bathing machines; *f*, the corridor; *g*, the surrounding gallery; *h*, the staircases leading into the water; *i*, the balusters at the bathing machines: all these parts have already been described in the explanation given in the first plate.

Cool Baths may be called those which are of a temperature between the 56th and 76th degrees of Fahrenheit's scale. They are of great service in all cases where cold bathing has before been recommended, and require nearly similar precautions. As their influence, however, on first entering them, is less violent, though their subsequent effect may be attended with equal advantages, it follows, that even persons of a more delicate organisation may resort to them with greater safety.

With respect to rules for cool bathing, we refer the reader to those already stated in the preceding analysis; and shall only remark, that notwithstanding its effects are less perceptible while the body continues in the water, it is necessary that the bather, on coming out of it, should be wiped dry with the greatest expedition, to prevent catarrhal affections.

Warm Baths, are such as have a temperature above the 76th, and not exceeding the 96th or 98th degree of the thermometer before-mentioned. There are various springs in Britain, especially those of Bath, Clifton, Buxton, and Matlock, to which Nature has given this temperature, the most beneficial to the human body. [In America we find warm baths in Virginia. All these are clearly owing to the springs that arise in the neighbourhood of subterranean fires, either volcanic, or owing to decomposed pyrites—T. C.] But whether the tepid bath of this description be natural or artificial, it is equally conducive to the restoration of energy, though its effects have, till lately, been little understood. Physicians, as well as patients, have hitherto been too generally accustomed to consider a warm bath as weakening the body, and useful only for the removal of certain diseases, especially those of the skin. Experience, however, has amply proved that there can be no safer and more efficacious remedy in a variety of chronic or inveterate complaints, than the warm bath, if properly used, and continued for a sufficient length of time. Dr. Marcard, resident physician of Pyrmont, has, in our opinion, satisfactorily demonstrated, that the *warm* bath, in many cases of debility, from spasms, pain, anxiety, and other causes, as well as to hectic and emaciated persons, is, *generally*, of eminent service, and almost the only means of restoring their health, and prolonging their lives. Instead of *heating* the human body, as has erroneously been asserted, the warm bath has a cooling effect, inasmuch as it obviously abates the quickness of the pulse, and reduces the pulsations in a remarkable degree, according to the length of time the patient continues in the water. After the body has been over-heated by fatigue from travelling, violent exercise, or from whatever cause, and likewise after great exertion or perturbation of mind, a tepid bath is excellently calculated to invigorate the whole system, while it allays those tempestuous and irregular motions, which otherwise prey upon, and at length reduce, the constitution to a sick-bed. Its softening and assuasive power greatly tends to promote the growth of the body; on which account it is peculiarly adapted to the state of such youth as manifest a premature disposition to arrive at a settled period of growth: and it has uniformly been observed to produce this singular effect, in all climates.

The warm bath is of very great utility to such individuals as are troubled with a parched and rough skin; it has also been found to afford relief in many paralytic, bilious, hypochondriacal, hysteric, and even insane cases, as well as to forward the cure of scorbutic and leprous eruptions when strict attention had been paid to both diet and regimen. In palsy, likewise, modern observers assert, that warm bathing is one of the most effectual remedies; though the late Dr Mead expressly maintained, that it is prejudicial to all paralytics. Dr Charleton, of Bath, was the first that refuted this assertion; because he had seen, in the hospital of that

city, numerous and manifest proofs of its efficacy in paralytic cases. This judicious physician remarks, in his "*Inquiry into the Efficacy of Warm Bathing in Palsies,*" printed in 1770, that he was induced to turn his attention to this subject, by the prevalence and increase of *nervous* diseases, but particularly on account of the *palsy*, which formerly used to be the attendant of the aged, but has now become the too frequent and miserable companion of youth. Of 996 paralytics, most of whom had resisted the powers of medicine, 813 were benefited by the proper application of the warm bath. It is perhaps necessary to remind the reader, that this desirable effect may be derived from the waters of Bath (of which we shall treat in a subsequent article), as well as from every other bath, whether furnished by Nature or Art, provided its temperature does not exceed 98°. We have purposely inserted Dr CHARLETON's account under the head of "Warm Bath," though the waters in the city of Bath must, consistently with our division, be classed under the following head.

4. HOT BATHS are those which have a temperature above 98 or 100 degrees of FAHRENHEIT, and are occasionally increased to 110 or 120° and upwards, according to the particular nature of the case, and the constitution of the patient. As no prudent person, we trust, will have recourse to a *hot* bath, without medical advice, we shall but briefly enumerate a few particulars relative to its use, as well as its effects.

1. Hot bathing, whether natural or artificial, is supposed to be the most general solvent of all the humours of the body; 2. It consequently is the most probable mean of removing obstructions of every kind; 3. Previous evacuations are necessary to cleanse the first passages, and prepare the habit; for which purpose, repeated emetics are often safe and useful; 4. Attenuating and aperitive medicines are proper to render the humours more fluid, and promote the discharge of noxious particles, and whatever caused the obstructions; 5. Too great a degree of heat, or too long a continuance in the bath; too heating a bed after it; profuse perspiration; exposure to cold air on bathing days; eating of high seasoned dishes, or drinking of spirituous liquors, during a course of bathing, are always improper, often dangerous and sometimes fatal; 6. The head should in no case be dipt, till the bather is rising out of the water; 7. A course of bathing should be long, be regulated by intervals, according to the various effects perceived by the bather; 8. The temperate seasons of the year are most proper, safe, and beneficial, both for drinking and bathing. On the whole, there can be no stated rules laid down, as every thing depends upon the peculiar circumstances of each patient; and hence Dr. OLIVER asserts, in his "*Practical Essays on the use and abuse of Warm* (hot) *Bathing, &c.*" that by the prudent use of the hot bath, most chronical disorders, and gouty cases in particular, *not in an inflamed state*, may be relieved, and sometimes cured; while persons in high health may be greatly injured by wantonly sporting with so powerful an *alterative* of the animal machine, either from sickness to health, or from health to sickness.

TEPID BATHING is highly useful in summer. As a free perspiration is thereby promoted, and the body more cooled than if the water used had been cold. Every person should use a tepid bath three times a week *at least*, in the summer, as the practice is not only very cleanly, but highly healthful, and contributes to remove that general disposition to fever that has unhappily prevailed during the Autumn, for some years past. It may be used either in the morning, at noon, or when going to bed. Every family ought to be supplied with the proper conveniences for warm and cold bathing. An expensive apparatus is by no means necessary, especially for the cold bath; but it is to be regretted that the danger of carrying a large quantity of heated water to an upper story is so great, as to prevent many persons from using the tepid bath, who have every disposition to enjoy it. If some contrivance could be effected to heat water in the tub, few families would be without them, as the water might be let in from the hydrants, and after being used, could be let out again by a pipe leading down the side of the house, or communicating with the rain spout.

Having now given a concise view of the four principal kinds of baths, with regard to the temperature of the water, we shall likewise notice another curious mode of bathing, as practised by the hardy Russians. We allude to the *Sweating* or *Vapour Bath*, which is used by persons of every rank and age, in almost every disorder; before and after a journey, hard work, &c. These are

frequented at least once a week, or as often as possible, whether in a state of health or sickness: the extraordinary degree of heat produced by the evaporation of water thrown upon red-hot stones, in a close room, raises the thermometer to 146, or 168 degrees; the latter of which numbers is a degree of heat considerably above that which melts wax, and only 12° below that for boiling spirit of wine. In such a bath, the Russians lie naked on a bench, and continue there, notwithstanding a profuse perspiration, sometimes for two hours, occasionally pouring hot water over their bodies: thus some, with a view to promote perspiration, and completely to open the pores, are first rubbed, and then gently flagellated with leafy branches of birch; while others wash their bodies with warm or cold water; and all of them at length plunge over head in a large tub of water. Many, however, rush out almost dissolved in sweat; and either throw themselves immediately from the bath-room into the adjoining river, or, in winter, roll themselves in snow during the most piercing cold, without suffering any inconvenience, and probably with advantage, for we understand that rheumatisms are scarcely known in Russia: and there is great reason to attribute this exemption to the use of the vapour-bath. Indeed, they differ from all the *balnea* of antiquity, as well as from those of the modern Orientals, in the circumstance of not being *dry* sweating baths; whence their peculiar excellence in many cases where *hot* water-baths would be inefficacious, or even hurtful. By exciting an unusual degree of perspiration, they promote cleanliness, while they render the skin soft and smooth, hence, again, they cannot be compared to the voluptuous baths of the Greeks and Romans; because all the consequences of effeminacy and luxury are here completely obviated. From the prejudices imbibed during a soft and effeminate education, this sudden transition from heat to intense cold, appears to us unnatural and dangerous, but it certainly hardens the body of the Russian, and enables him to brave all the vicissitudes of the weather, and all the severities of his climate.

To conclude this interesting subject, we shall avail ourselves of a few additional observations, extracted from a late work of acknowledged merit, entitled, "*A View of the Russian Empire*, &c." by the Rev. W. Tooke, who resided many years in that country; and to whose sentiments we cordially subscribe.

"It is not to be doubted that the Russians owe their longevity, their robust state of health, their little disposition to certain mortal diseases, and their happy and cheerful temper, mostly to these baths: though climate, aliment and habits of living, likewise contribute their share. The great lord chancellor Bacon, and other sagacious observers of nature and of mankind, have lamented, and certainly not without cause, that this bathing has fallen into disuse among the modern nations of Europe, and justly wish the practice back again in all our towns and villages. In fact, when we consider that the old physicians so early introduced into their practice this remedy of Nature's own invention, and employed it with such great success; when we recollect that Rome, for five hundred years together, had no physicians, but only baths, and that to this day a multitude of nations cure almost all their maladies merely by baths; we cannot avoid regarding the dismission of them as the epocha of a grand revolution which has been wrought in the physical state of the human race, in our quarter of the world.

"The natural perspiration, the most important of all excretions, must naturally go on better in a body constantly kept soft by bathing. A great number of impurities which privily lay in us, the train to tedious and dangerous distempers, are timely removed, ere they poison the blood and the juices. All exanthematic diseases are abated by bathing, consequently then the small-pox; and if this dreadful disorder be actually less fatal in Russia than in other countries, this phenomenon need not be attributed to any other cause than the vapour-baths."

A discovery called the '*The Patent Portable Warm Bath*," claimed by Dr. Jennings, of Virginia, has drawn the attention of the public, who, too fond of believing, have given that merit to the doctor, which, perhaps, justly belongs to another.

The following extract will prove that the discovery was known upwards of a hundred years before Dr. Jennings declared himself to be the inventor, and to the public we leave the determination, who is justly entitled to the honour of the invention.

Extract from a German work on the venereal, by Stephen Plancard, printed in Leipsic, in 169 . "But if the patient wishes to become well, he is obliged to undergo something more, and every day, or at farthest, every other day, according as the patient can bear it, to have the spirits applied so as to produce sweating. This process is conducted in several ways. The first is the patient is put to bed quite naked, over the body is extended three or four half hoops, to support the bed clothes, when this is done you take a *tin instrument*, where *a a*, represents a hollow ascending pipe or tube, which may be put together by pieces, in order to accommodate it to the height of the bedstead there is another pipe *c d*, which passes from the pipe *a a*. The bottom of the instrument is wide like a funnel with a small door represented by *e*—when every thing is prepared, you open the door of this *tin sweating instrument*, and let under it a saucer with spirits. The patient is closely confined under the hoops, with the bed clothes stuffed in, so that the head only is left out. The holes of the apparatus being well stopped, you kindle the spirits with a match, so that all the steam passes through the tube and under the bed clothes, by which the patient, as long as he can bear it, is sweated. If the spirits be occasionally extinguished, you must pour in fresh, but only a small quantity at a time, otherwise the sweating will be too severe. When the sweating is finished, you reach the patient warm draughts of the decoction of woods, to drink, and so let him remain in bed."

BATHING, in general, signifies the act of immersing the body, or part of it, into water, or any other fluid, and is a practice coeval with mankind.

The ancient Greeks, Romans, and Germans, as well as the Persians, Turks, and especially the modern Egyptians, enjoy the comforts and luxuries procured by bathing, in a degree of which we can scarcely form an adequate conception. Those who wish to amuse themselves with reading one of the most animated, nay almost enchanting accounts relative to this subject, we must refer to M. SAVARY's "*Letters on Egypt*." From these it appears, that bathing is employed by those voluptuaries, not only for procuring the most delightful sensations and removing that irksomeness and apathy which is the general concomitant of an idle or sensual life, but likewise with a view to prevent or cure rheumatisms, catarrhs, or such cutaneous diseases as their climate produces, by an atmosphere loaded with humid and impure exhalations, and highly unfavourable to insensible perspiration. The Egyptian baths are said to be heated by the steam of water artificially combined with odoriferous fumes, which penetrate into all the pores, so that they are, in some degree, similar to those of the Russians, before described. And though M. TOURNEFORT is of opinion that vapour baths have a tendency to injure the organs of respiration, yet if credit be due to SAVARY, there are no people on earth who are less troubled with asthmatic complaints than the Egyptians, and few nations so passionately fond of such bathing. In short, we cannot suppress the remarks formerly made on this important branch of dietetic regimen, that, "though the ancients could less dispense with the use of the bath, on account of the frequency of their athletic exercises, as well as from the want of linen, which was then much less in use than at present, yet in our times, it would be of great service, if the use of baths were more general and frequent, and this beneficial practice not confined to particular places or seasons, as a mere matter of fashion. Considered as a species of universal domestic remedy, as one which forms the basis of cleanliness, bathing, in its different forms, may be pronounced one of the most extensive and beneficial restorers of health and vigour."

BATHS, (*Dry*) were formerly made of ashes, salt, sand, shreds of leather, and similar substances. CELSUS informs us, that the ancients had a variety of sweating baths by a dry heat, and especially by certain steams naturally emitted from the earth, and received under a proper arch or hot-house, or sometimes by means of hot sand, stoves, rooms, or artificial bagnios. We would preferably recommend the *Prussian Vapour Bath*, which was lately used in the army of that kingdom, with a most general success. It simply consists of a close wooden box, the lower part of which resembles a common night chair,

in which is placed a large vessel with boiling water. the upper compartment has only one aperture on the top, opening with two horizontal doors, having in the centre an excision, large enough to admit a person's neck with ease In such a box the patient is placed for one, two or three hours, according to the nature of his case, and the degree of perspiration deemed necessary. There can be no reasonable objection against this simple contrivance, which, with a few improvements, deserves to be adopted in the British army, and especially in the navy, where want of room, and other circumstances, might render it, on many occasions, extremely useful. If in a close box a seat be fixed, the top to lift up, with an aperture to admit the neck, it may be converted into an excellent steam bath. A kettle on a common fire, with a tin tube to fit the spout, will furnish plenty of steam. The tin tube may enter near the bottom of the box. I have often tried this. T. C.]

BATH, (*Earth*) is a modern contrivance, which was introduced into this country by a late notorious empiric: it consists of a cavity dug in the ground, into which patients descend as far as the chin, while the interstices are expeditiously filled up with fresh mould, so that the soil may come in contact with every part of the body.

Earth-Baths are often employed by the Spaniards, in cases of hectic fever, and pulmonary consumption: a few years since they became fashionable in London as well as at Bath; but having often been misapplied, by fanciful and ignorant persons, they were soon relinquished, and have now fallen into disrepute, Such baths, however, have occasionally proved (see Dampier) very efficacious in the sea-scurvy; and, if judiciously managed, under medical superintendance, they may be of essential service in cases of incipient phthisis.

BATHS. (*Medicated*) are those saturated with various mineral, vegetable, or sometimes animal substances. Thus we have sulphur and steel baths, aromatic and milk baths: there can be no doubt, that such ingredients, if duly mixed, and a proper temperature be given to the water, may, in certain complaints, be productive of effects highly beneficial. We well remember the pompous reports published several years ago by two notorious empirics, and attested by many of our first nobility, who permitted their names to be bandied about publicly, in consequence of wonderful cures said to have been performed by the most whimsical combinations of things and circumstances. Although we are not inclined to question the truth of these specious cures, yet it is remarkable, that such extraordinary facts, if they were facts, should, in the course of a few years, so far from being improved upon, and rendered of practical service to suffering humanity, have been totally consigned to oblivion. Notwithstanding this unfavourable result, it would be unreasonable to impute the want of farther success to the inefficacy of medicinal substances, or the baths themselves; on the contrary, we venture to pronounce, that both will operate, when properly used, in an uniform manner, so long as the nature of man and diseases, are conformable to general laws. Hence our success will always less depend upon the specific *virtues* of substances or drugs, than upon the manner in which they are used for particular purposes

Water impregnated with the scales of rust of iron, which abound with the saline and sulphureous particles of that metal, is of great service for strengthening the part to which it is applied; re-invigorating debilitated limbs; stopping various kinds of bleeding; restoring the menstrual and hemorrhoidal discharges when obstructed; and, in short, as a substitute for the natural iron-bath.

There are various other medicated baths, such as those saturated with alum and quick lime, sal ammoniac, &c. by boiling them together or separately in pure rain water; they have long been reputed as eminently serviceable in paralytic, and all diseases arising from nervous and muscular debility. Lastly, it is worthy of remark, that all mineral waters presented to us by the beneficent hand of Nature, may be artificially prepared with tolerable accuracy, and sometimes of superior efficacy, when we are sufficiently acquainted with the component parts of such springs

[*Vapour Baths* are now out of fashion, but it is certain that the virtues of many drugs useful as external applications, might be thus conveyed immediately to the surface, not only of the body generally, but of the part affected. One pipe might supply common, and another pipe medicated vapour. T. C.]

BATH-WATERS are celebrated on account of their having a higher temperature than any other in Britain, and

being the only springs which are sensibly hot to the touch. All other *thermal* waters of this island are below the animal temperature, and deserve that appellation only, from being invariably warmer than common springs are in general.

By the erection of elegant baths, these waters are particularly adapted to the benefit of invalids, who find here a variety of establishments, contributing equally to health, convenience and amusement

There are three principal springs in the city of Bath, namely, those called the King's Bath, the Cross Bath, and the Hot Bath, all within a short distance of each other, and emptying themselves into the river Avon, after having passed through the several baths. Their supply is so copious, that all the large reservoirs used for bathing, are filled every evening with fresh water, from their respective fountains In their sensible and medicinal properties, there is but a slight difference: according to Dr FALCONER, the former are, 1. That the water, when newly drawn, appears clear and colourless, remains perfectly inactive, without bubbles, or any sign of briskness or effervescence; 2 After being exposed to the open air for some hours, it becomes rather turbid, by the separation of a pale yellow, ochery precipitate, which gradually subsides, 3 No odour is perceptible from a glass of the fresh water, but a slight pungency to the taste from a large mass of it, when fresh drawn, which, however, is neither fetid nor sulphureous; 4 When hot from the pump, it affects the mouth with a strong chalybeate impression, without being of a saline or pungent taste; and 5. On growing cold, the chalybeate taste is entirely lost, leaving only a very slight sensation on the tongue, by which it can scarcely be distinguished from common hard spring water.

Dr SAUNDERS estimates a gallon of the King's Bath water to contain about eight cubic inches of carbonic acid, and a similar quantity of air, nearly azotic; farther, about eighty grains of solid ingredients, one half of which probably consist of sulphat and muriat of soda; 15½ grains of siliceous earth, and the remainder is selenite, carbonate of lime, and so small a portion of oxyd of iron, as to be scarcely calculable.

BATTALION, a small body of infantry, ranged in form of battle, and ready to engage.

BATTALION, in number, is usually from 400 to 800 men; but the number is not determined. It is divided into thirteen companies, one of which is posed of grenadiers They are usually drawn up three men deep. Some regiments consist of but one battalion; others are divided into four or five.

BATTERING-RAM, a military engine used before the invention of gunpowder, to beat down the walls of places besieged. It consisted of a vast beam suspended to a frame, and armed at one end with a head of iron, resembling that of a ram; from the butting of which animal the idea was doubtless derived. This being equally balanced, and furnished with a number of ropes, at the extremity opposite to the ram's head, a great number of men threw it forward with violence, and thus *battered in breach*.

BATTERY, in the military art, a parapet thrown up to cover the gunners and men employed about the guns from the enemy's shot. This parapet is cut into embrasures, for the cannon to fire through. A *battery of mortars* is sunk in the ground, and has no embrasures *Cross batteries* are two batteries which play athwart one another upon the same object, thus forming an angle, and beating with great effect, because, what one battery shakes the other beats down. A battery sunk, or buried, is where the platform of which is sunk or let into the ground, so that there must be trenches cut in the earth, against the muzzles of the guns, for them to fire out at, and to serve for embrasures. *Battery d'enfilade*, is one that scours or sweeps the whole length of a straight line *Battery en echarpe*, is that which plays obliquely. *Battery de revers*, that which plays on the enemy's back. *Camerade battery*, is when several guns play at the same time upon one place.

BATTERY, in electricity, is a combination of coated surfaces of glass, commonly jars, so connected together that they may be charged at once, and discharged by a common conductor. Dr. Priestley describes a complete battery This consists of 64 jars, each 10 inches long, and 2½ inches in diameter, all coated within an inch and a half of the top, forming in the whole about 32 square feet, of coated surface. A piece of very fine wire is twisted about the lower end of the wire of each jar, to touch the inside coating in several places; and it is put through a pretty large piece of cork, within the jar, to prevent any part of it from touching

the side, by which a spontaneous discharge might be made. Each wire is turned round so as to make a loop at the upper end; and through these loops passes a pretty thick brass rod, with knobs, each rod serving for one row of the jars; and these rods are made to communicate together by a thick chain laid over them, or as many of them as may be wanted. The jars stand in a box, the bottom of which is covered with a tin plate: and a bent wire touching the plate passes through the box, and appears on the outside. To this wire is fastened any conductor designed to communicate with the outside of the battery; and the discharge is made by bringing the brass knob to any of the knobs of the battery. When a very great force is required, the size or number of the jars may be increased, or two or more batteries may be used.

Battery Galvanic, or Pile, an apparatus employed for accumulating the electricity of galvanism, which is produced by the mutual agencies of certain metallic substances, and peculiar fluids. It was invented by the celebrated Volta, from whose labours the new science of galvanism has derived many advantages and much improvement.

BAYONET, in the military art, a short three-sided dagger, formerly with a round handle, fitted for the bore of a firelock, to be fixed there after the soldier had fired; but they are now made with iron handles and rings that go over the muzzle of the firelock, and are screwed fast, so that the soldier fires with his bayonet on the muzzle of his piece, and is ready to act against the horse. This use of the bayonet fastened on the muzzle of the firelock was a great improvement, first introduced by the French, and to which, according to the chevalier Folard, they owed a great part of their victories in the last century; and to the neglect of this, in the next succeeding war, and trusting to their fire, the same author attributes most of the losses they sustained.

BAYS, or *Baize*, in commerce, a sort of open woollen stuff, having a long nap, sometimes frized, and sometimes not. This stuff is without wale; and is wrought with two treddles, like flannel. It is chiefly manufactured at Colchester and Bocking in Essex, where there is a hall called the Dutch Bay-Hall, or Raw-Hall. This manufacture was first introduced into England by the Flemings, who being persecuted by the Duke of Alba, on account of their religion, fled hither about the fifth of queen Elizabeth's reign.

BAY-SALT, a kind of brownish impure salt, manufactured in France, Italy and other countries, by evaporating sea-water in clay-pits, which is effected at a small expense, and with little trouble.

This salt is more or less adapted to all domestic uses, and forms a profitable article of commerce, as it is exported in large quantities. According to the clay employed in making the pits, it acquires different shades of colour; and, in favourable seasons, the French manufacture not only what is wanted for home consumption, but likewise considerable quantities for exportation. The greatest difficulty which attends the making of bay-salt in England, arises from a deficiency of heat in summer; because the rays of the sun are not powerful enough to evaporate a large mass of sea-water in a certain time.

BAY-TREE, or *Laurus*, L. is an elegant tree, of which there are many species.

The 1. *Laurus nobilis*, L. or Evergreen Bay, is a native of Italy, with an upright trunk, branching out on every side.

The dark-green leaves of this tree afford, by distillation, a very useful oil, which is employed, both in medicine, and as a culinary spice. The fragrant, but bitter berries, also yield an essential oil, and in a much greater proportion: it has sometimes been used with advantage in nervous and paralytic affections. With the foliage of this beautiful tree, which, among the ancients, was consecrated to Apollo, they crowned their poets and heroes.

2. The *Laurus æstivalis*, or Deciduous Bay; spice berry, or spice-wood; a native of the United States. It rises with an upright stem, covered with a purplish bark, and has oblong, oval, and deciduous leaves.

3. The *Laurus Benzoe*, L. or Benjamin Tree, which grows fifteen or twenty feet high: and

The *Sassafras*; both species are also natives of America.

Professor Kalm, in his travels through America, informs us, that the bark of the species called *Sassafras* is used by the women of Pennsylvania for dyeing worsted of a permanent and beautiful orange colour, which is not affected by the rays of the sun. They make

use of urine instead of alum, in preparing this dye, which is boiled in brass vessels: the wood is employed for posts of inclosures, because it is found to last a long time in the ground; but when exposed to the air and rain, there is scarcely any timber more subject to be destroyed by worms. The same writer informs us, that the sassafras root is frequently peeled, and put into beer, while brewing; and also into brandy. A decoction of the root in water, drank every morning, has, according to him, been used with success in the dropsy.

4 The *Laurus Cinnamomum*, L. or Cinnamon-Tree, is a native of Ceylon.

With respect to the culture, or propagation of this valuable tree, in its native places, we possess no particular account.

According to the account given by Dr. Wright, its propagation is very easy, and its culture requires but little care. Dr. Dancer asserts, that the tree puts out numerous side branches, with a dense foliage, from the very bottom of the trunk; this furnishes an opportunity of obtaining a sufficiency of layers, and facilitating the growth of the tree, which does not perfect its seeds in any quantity under six or seven years, when it becomes abundantly loaded. It seems to delight in a loose, moist soil, and to require a southern aspect: the trees thus planted, flourish better than others which grow in loam, and are not so much exposed to the sun. When healthy, it is reared from layers of a pretty quick growth, attaining in eight years the height of fifteen or twenty feet.

The cinnamon-tree, with other valuable plants, was taken in a French ship by Admiral Rodney, in the last war, and presented to the Assembly of Jamaica. From this parent tree, several hundreds of young plants are already procured, and transplanted in different parts of the island, in all of which it thrives luxuriantly.

The best cinnamon bark taken from the trees growing in Jamaica, is that from the branch of about an inch in diameter; as the larger ones do not yield so good a spice. It is the inner rind that constitutes the cinnamon, from which the two external coats must be separated.

Cinnamon, though more retentive of its properties than any of the other species, yet requires to be excluded from the air and moisture. The leaves of this tree, whether fresh or dried, are strongly aromatic, and afford a good substitute for the bark, both in cookery and medicine. In distillation, they yield a fragrant spirituous water, and an essential oil: when reduced to powder they form a good perfume.

5. The *Laurus Cassia*, L. or Base Cinnamon, has lanceolated leaves, triple nerved. The bark of this species is imported from different parts of the East Indies and from China. It resembles cinnamon more in its aromatic flavour than in external appearance, as it is thicker and coarser: it farther differs from it, in being weaker, abounding more with a viscid mucilaginous matter, and being less astringent; as likewise by its breaking short and smooth, while the cinnamon breaks fibrous and splintery.

6 The *Laurus Camphora*, L. or Camphor Tree, grows wild in the western woods of Japan, and in the adjacent isles. The root of this tree smells stronger of camphor than any other part, and yields it in greater abundance. This is another of the captured plants presented to the inhabitants of Jamaica, and if cultivated with care, will also be a beneficial acquisition.

The Abbe Grosier informs us, that in China this tree grows to above 150 feet high, and more than 40 yards in circumference. The camphor is obtained by lopping the branches, which the Chinese chop very small, steep in spring water for three days, and afterwards purify the sap by boiling.

Bureaus, writing desks, and wardrobes, are sometimes brought from China, made of the camphor tree, which have a strong smell of that drug, and infallibly keep away bugs, moths, &c.

7. The *Laurus Persea*, L. or the Alligator pear tree, is another species of the bay, which is generally cultivated in the West-Indies. It rises to a considerable height, with a straight trunk: the bark is of a greyish colour; the leaves of a beautiful green. Its fruit is pear-shaped, and from one to two pounds weight. It affords an agreeable article of diet to the negroes, and with a little salt and a plantain furnishes a nourishing repast. When the pear is ripe, its pulp is harder than butter; and from its similarity in taste to that animal oil, it is called vegetable marrow.

There are several other species of the bay tree, which we shall not enumerate, as they are of inferior value, and consequently less interesting.

BAZAR, or *Basar*, also called *bezestin*, is a kind of exchange or market

place among the Turks and Persians. Some of these buildings are remarkable, not only for their extent, but for their magnificence.

BDELLIUM, a gummy resinous juice, produced by a tree in the East Indies, of which we have no satisfactory account. It is brought into Europe from the East-Indies, and from Arabia. As a medicine, in which quality it is brought to market, it is better in its simple state, than when formed into any preparation. It is one of the weakest of the deobstruent gums, but it is used as a pectoral, and emmenagogue.

BEACON, any object serving as an occasional signal, or as a constant sea-mark, by means of which ships may be warned of danger, or assured of their port. The king has the exclusive power, by commission under his great seal, to cause them to be erected in fit and convenient places, as well upon the lands of the subject as upon the demesnes of the crown, and, by statute 8 Eliz c 13 the corporation of the Trinity house, is empowered to set up any beacons or sea marks wherever it shall think them necessary and if the owner of the land, or any other person, shall destroy them, or shall take down any steeple, tree, or other known sea mark, he shall forfeit 100*l* or, in case of inability to pay it, be, *ipso facto*, outlawed.

BEAN, or *Vicia Faba*, L a genus of which there are four species commonly reared in the gardens of this country. 1 The small *Lisbon*, or *Masagan*, 2 The *Spanish*, 3 The *Sandwich*, and 4. The *Windsor* Beans. The Masagan beans are esteemed either for the table or cattle, they are the earliest of all, as palatable as the Windsor, and should be cultivated in a loamy soil, in rows nearly a yard distant from each other, and about four inches in depth. The first crop ought to be set about the latter end of March, or beginning of April the second in May, but not so thick as the former.

If the rows should appear too thin, some may be transplanted from those which are thicker, but all ought to s and four inches distant from each other and afterwards to be moulded and hoed during the summer.

In the beginning of May the first sown beans will blossom from the bottom to the top, even if they rise to the height of three feet, they grow strong, and send three or four stalks from one root, but should never be lopped as this would prevent the pods from arriving at their full growth.

An experienced horticulturist, says, they are better for being lopped, as the beans thereby set more quickly and certainly.

When ripe, they should be pulled, and set upright to dry, and may afterwards be split, in which state they are excellent food for horses and swine. The bean straw is also beneficial, as the produce of ten acres, when cut to chaff with a three knife machine, will supply sufficient nourishment for ten cows and two calves, for 20 weeks. A man is able to cut as much in 12 hours, as 12 head of cattle can eat in a week. Cows, when kept on this food alone, will eat about 25lb a day.

The *Masagan* should be imported from *Lisbon*, as the seed is disposed to degenerate in this country, unless care be taken to sow the largest and first ripe.

Spanish Beans should be planted in October and November, sheltered by walls or hedges, where, if they survive the severity of the season, they will come to perfection early in summer. They may also be raised very close in beds, if covered with mats in winter, and transplanted in spring.

The *Lisbon Bean* is preferred to the Spanish, but as it is apt to degenerate, by ripening early, though not in any perfection, fresh seed ought to be imported every two years. The Spanish and Windsor beans, which are those generally used at table, should not be planted till after Christmas, but especially the Windsor, which are more liable to injury from cold than any other kind. These beans require an open ground, and should be set at the distance of three feet and a half between the rows, and five or six inches from each other.

The *Sandwich Beans* are hardier than the Windsor, and may be planted so early as to be fit for use between these and the early crops. This species, however, has lately been much neglected. Windsor beans should first be set about the middle of April, and a new plantation made every three weeks, till the middle of May, to ensure succession of crops.

M Deane, N E Farmer, says, when they are about a yard high, the tops should be broken off in the same manner as tobacco. When the first crop is gathered, the stalks should be cut off close to the ground, excepting those on which seed is left to grow more perfectly ripe. The suckers will raise from the roots, and give another green

crop late in the autumn. In general, however, these beans ripen about midsummer, in Pennsylvania, and, if the cut down, would be destroyed by the heat of the sun. A second crop, however, may be obtained in a fine season by sowing those first ripe. They will most commonly escape the fly. Windsor beans flourish on a stiff clay, and should be drilled on account of the ease with which they may be hoed. See article DRILL.

Another kind much planted at present, on account of its great produce, is the *Toker*: it comes to perfection about the same time as the Sandwich. The black and white blossomed beans are also much esteemed, but unless their seeds be preserved with care they are apt to degenerate.

The *Horse Bean* [much used in England as horse feed, but not in America, where maize is a substitute for it.—T. C.] is the only kind propagated by the plough. It delights in a stiff and moist clay; three bushels are sufficient to sow an acre, which ought to be performed in March or beginning of April, and the general produce of an acre is about twenty bushels. But it is worthy of remark, that by the new improvements in husbandry, less than one bushel of seed is sufficient to plant an acre of land, and the produce has sometimes been found to exceed that of the old method, by ten bushels per acre. The beans should lie some time upon the ground after they are cut. To keep the soil clean from weeds, when intended for a crop of beans the next year, dung should be laid on the land as soon as the wheat stubble, or haulm, is carried off, this method having been found more effectual in preventing the growth of weeds, than by ploughing in the haulm, and laying the dung upon fallow lands.

As soon as the beans have acquired six leaves, sheep should be turned in, to feed among them: they will eat all the young weeds, even the melilot, but will not hurt the beans, provided they are not suffered to lie down.

A writer in the *Gentleman's Magazine* for 1764, recommends the planting of horse beans by the following method. Take a plank of oak, of such a size as a man can easily manage by a handle fixed upright in the middle of it, and of such thickness as not to give way in working; in the under part of this plank let there be fixed wooden pegs of such length, and at such distance from each other, as may form proper holes or beds in the ground for the beans.

When the land has been properly prepared, the workman must thrust the pegs of this instrument into the ground, and proceed sideways, managing it so, that there may be the same distance between the last row of holes made by the first impression, and the first row made by the next, as there is between the rows of any one impression. The youngest children may be taught to follow the instrument, and drop a bean into every hole that it makes.

As the topmost blossoms seldom come to perfection, they should be taken away when those toward the bottom of the stalks first appear, which may be done by garden-shears with long handles; the furrows being left wide enough for a careful person to walk in them, without damaging the crop, and the cuttings, by covering the ground, will shade it, keep it moist, and gradually be converted into manure, which, as strong lands are apt to chap, and such only being fit for beans, will be of great utility.

Beans intended for seed, should be plucked up by the roots, before they are quite ripe, instead of cutting the stalks; thus they will receive nourishment enough after being removed, to ripen fully, and no seed will be lost, which otherwise happens to a great quantity, in their cutting and removal.

Beans have long been used by our most celebrated agriculturists, as a preparatory crop for wheat lands. The beneficial effects of this method are so well known, that it is unnecessary to expatiate upon the subject. We must, however, observe, that in the year 1795, the *Society for the Encouragement of the Arts* adjudged a premium of twenty guineas to LEWIS MAJENDIE, Esq. an ingenious improver of rural economy (whose successful exertions in planting ash, we have noticed p. 103,) for his judicious culture of beans and wheat. He sowed fifteen acres in February, 1794, with the *Vicia faba equina*, or small horse bean. The quantity of seed was 6 pecks to the acre, and the total expense 29*l* 14*s* 3*d* or 1*l* 19*s* 7½*d* per acre. The produce was fifty nine quarters and one bushel, which were sold for 120*l* 11*s* and 6*d*. A detailed account of this interesting experiment may be seen in the fourteenth volume of the *Society's Transactions*.

In the year 1796, Mr. JOSEPH WEB

SPER, of Bankside, near Doncaster, received a similar premium from the Society, for having drilled sixteen acres of land with beans, and sown it with wheat in the same year. He employed COOKE's Drill Machine, and the beans were of the same species as those sown by Mr. MAJENDIE.

Another premium was also given to Mr ROBERT DUDGEON, of Tynningham, who, in the spring of 1797, drilled three fields, containing nearly twenty-three acres and a half, with beans, and sowed them with wheat in the same year. This process is described, at considerable length, with several interesting remarks, in the seventeenth volume of the above-mentioned work.

The Duke of GRAFTON, about eleven years since, made an experiment, to ascertain whether the soil of the common fields of Northamptonshire, and the adjacent counties, would alternately bear a crop of wheat and beans, for a series of years; after giving it a light dressing of dung, namely, from twelve to fifteen loads per acre, every third year, without rendering the land poorer than it was when first cultivated for this purpose. After having manured the field in the manner specified, the Duke, in the first year, sowed one half of it with wheat, and the other half with beans. The success of this plan was so great, that in a letter to ARTHUR YOUNG, Esq. dated Aug st, 1799, he observes, he has continued this alternate course of crops ever since, without having in a single instance admitted a fallow!

Having stated these useful and interesting facts, we shall submit the practical application to the judgment of the reader. But the last-mentioned experiment by no means proves, that a summer fallow may not, on some particular lands, be of great advantage to ensure a succession of crops

The field beans make an excellent fallow crop, and are now much used in Lancaster county, Penn for that purpose. Mr. BORDLEY says, "They ought to be sown in rows, about 10 inches apart, the intervals between the rows 20 inches, they must be horse-hoed or skimmed frequently, whereby the ground is kept stirred and clean, so as to be a well prepared fallow for receiving another crop."

The field white beans grow best on a dry and warm soil, but moderately rich. The way to harvest them, is, to pull them up by the roots, a short time before the first frost is expected, and let them lie on the field. The green ones will soon ripen, and escape injury from the frost. They must be gathered and secured, before they begin to scatter from the pods. The haulm, or vines of beans, must be carefully preserved and given to sheep, no other creature will eat them.

These beans are, unfortunately, very apt to be destroyed by an insect of the puceron tribe. Where this is the case, the early English garden pea, may be substituted. Mr. B says that Mr. PARKINSON, has induced him to believe they would answer a better purpose as a fallow crop, than the beans

The *Caseknife Bean*, *Dolichos ensiformis*, is so called, because the pod is shaped like that instrument, and about the same size. The green pods half grown are excellent food when cut small. This bean, like all others of the running kind, is produced in great plenty, by using the manure of hogs, with a little mixture of ashes They are a tender plant, and should not be put in the ground till after the first of May. The poles for them to climb upon, may be set at the time when the seed is put in, or afterwards, as may be most convenient. They are very productive.

Canada beans have no running vines. They ripen early, and are fruitful. They are oblong shaped, and of various colours. The pods are not so tender as to be good for eating, unless when very young. These and all other of the bush kind, grow best in the drill way.

With respect to the properties of beans, in general, they are nutritive, but tend to produce flatulency Hence they ought to be boiled in their fresh state, when they are less flatulent, and more easily digested The horse bean has been used as a substitute for coffee, which it much resembles in taste, though it does not contain more than half the quantity of oil.

French Beans, when eaten before they attain to maturity, are equally palatable and wholesome; and, if ground and mixed with wheaten flour, they would, like other beans or peas, make a good and nourishing bread; yet the *daily* use of it is apt to produce costiveness, and otherwise to disorder the alimentary canal

Bean Flour, as Dr DARWIN observes, is probably more nutritive than that of oats, which appears by its effect in fattening hogs, and from the relative prices of these articles, he is of opinion, that

peas and beans in general supply a cheaper provender for horses and other animals. But, as the flour of beans and peas is more oily than that of oats, it must be more difficult of digestion. Hence, when a horse has been fed with pulse, he will be less active for an hour or two afterwards, than if he had eaten oats. It will, therefore, be advisable to mix pollard, or straw finely cut, with peas and beans, before they are given to cattle.

Bean Fly—Great injuries are frequently done to beans, especially after a long drought, by a fly called the *dolphin;* (perhaps the same insect term- the Black-bean puceron) It is first observed on the top of the plant, and thence eats its way downwards, leaving the stem naked. These insects are so small and light as to be often carried by the wind from one plant to another, and thus injure the whole crop They seldom appear till after the beans are in blossom; and if carefully examined, it will be often found that they are confined to a small space On their first appearance, it has been observed that one row of beans has been greatly tainted by them, while another at the distance of six or eight feet, continued uninjured. At first the top leaves and blossoms are attacked by these insects, in consequence of which they appear shrivelled, and full of black sh specks. Whenever this is perceived, the tops should be lopped and removed If care be taken to leave none that are tainted, the malady will be effectually remedied

A crop has often been preserved by lopping off the head of the plant, before the insect had descended, for it has seldom been known to rise after falling with the bean top to the ground. If, the plot is small, and lies near the farm yard, the most effectual remedy is to turn the poultry into it; for they devour, in a very short time, an incalculable number of insects.

Among the ancients, many prohibitions were uttered against beans by various teachers The reasons upon which they were thus interdicted are not clearly understood by the moderns. The precept of Pythagoras, "Abstain from beans," has been variously interpreted. It is generally supposed to have some hidden meaning Beans were used in balloting for public offices; and hence some have imagined that Pythagoras, in reality, charged his disciples not to meddle with the affairs of the state. For whatever reason, beans appears to have been held by several nations in aversion, and even abhorrence. Cicero suggests, that they are unfavourable to tranquillity of mind.

BEAN, the Kidney, or *Phaseolus,* L. is a plant of one species, with several varieties. Those principally cultivated for the table, are, 1. The common, white, or *Dutch kidney bean;* 2. The smaller kidney, commonly called the *Battersea bean;* and 3 The upright sort, called the *Tree Kidney bean.*

The first of these varieties grows very high, and requires long stakes and poles for its support; its beans are of a considerable size

The second kind, or Battersea bean, is more generally cultivated: it never grows very high, and, on account of its moderate growth, the air can easily pass between the rows. It bears abundantly, and is the most savoury kind, except the Tree kidney bean This is also a plentiful bearer, never rambles far, and grows up in the form of a shrub; its beans are broader than those of the Battersea kind.

They are all propagated from seeds, which should be sown in dry weather, about the tenth of April, to produce an early crop; but they require a dry soil and warm situation. The best method of sowing is, to draw parallel lines over the bed, at two feet and a half distance, into which the seeds are dropped about two inches asunder, and the mould drawn over them to the depth of an inch, with the head of the rake. About a week after sowing, the plants will come up, when the mould should be raised round their stalks as they rise: they will require no farther care except weeding, and when the beans appear, they should be gathered twice a week, for, if suffered to hang too long, they weaken the plant, and become of little value. The first crop of kidney beans will continue a month; and, to supply the table afterwards, there should be fresh sowings in April, May, and June, the last of which will be in season, till destroyed by the frost Early crops may also be raised in hot beds, in the same manner as early cucumbers

The *Lima bean* is highly esteemed as a table vegetable They are very much disposed to rot, if they do not vegetate soon after being put in the ground; for this reason, the soil must be dry and warm, and the seed put in later than the other kinds The Carolina bean appears to be only a variety, or

small kind of the Lima bean, owing probably to negligence in collecting the larger sort for seed.

There are also some others, the culture of which is universally known in the United States, such as string beans, and snap-shorts, which when boiled, form a very wholesome and palatable vegetable food. They are commonly cut in small pieces, but are better when boiled whole. See DOLICHOS.

BEAR, or *Ursus*, in natural history, a genus of curious quadrupeds, consisting of eight species, the most remarkable of which are,

The common bear, (*Ursus arctos*,) is a heavy looking quadruped of large size, covered with shaggy blackish hair, and has a prominent snout, a short tail, and treads on the whole sole of its foot.

It is found in marshy woods of the northern parts of Europe and Asia, and is likewise found in Egypt, Barbary, and India.

The hunting of bears is an extremely important pursuit to the inhabitants of nearly all the countries in which they are found; and in many parts of the world it constitutes their principal and most profitable employ. The *skins* are made into beds, covertures, caps, and gloves. Of all coarse furs these are the most valuable, and when good, a light and black bear's skin is one of the most comfortable, and at the same time one of the most costly, articles in the winter wardrobe of a man of fashion at Petersburgh or Moscow. In England bears' skins are used for hammer-cloths for carriages, pistol-holsters, and other purposes The leather prepared from bears' skin is made into harness for carriages, and is used for all the purposes of strong leather.

Nearly every part of the bear is of use Its *flesh* is a savoury and excellent food, somewhat resembling pork; and that of the paws is considered a delicacy in Russia, even at the imperial table. The *hams* are salted, dried, and exported to other parts of Europe The flesh of young bears is as much in request in some parts of Russia as that of lamb is with us.

Bears' *fat* is frequently employed as a remedy for tumours, rheumatism, and other complaints. An oil prepared from it is adopted as a means of making hair grow This fat is likewise used by the Russians and Kamtschadales with their food, and is esteemed as good as the best olive oil. The *intestines*, when cleansed and properly scraped, are worn by the females of Kamtschatka, as masks to preserve their faces from the effects of the sun, which being reflected from the snow, is found to blacken the skin; but by this means they are enabled to preserve a fair complexion. These intestines are also used instead of glass for windows. In Kamtschatka the *shoulder-blade bones* are converted into sickles for the cutting of grass.

The modes in which bears are caught or killed are too numerous to be described in this place. These animals chiefly frequent the most retired parts of forests; and their habitations are dens formed beneath the surface of the ground, in which they pass the winter in a state of repose and abstinence. In some countries, where they are suffered to live without much molestation, they are quiet and inoffensive animals; but in others they are extremely surly and ferocious

The white or polar bear (*Ursus maritimus*) is a quadruped of large size, sometimes measuring near twelve feet in length, and covered with long, coarse, and shaggy white hair, the head and neck much longer in proportion than those of the common bear, and the tail short

The sea-shores of Greenland, and other countries within the Arctic circle, as well as the immense islands of ice which abound in the Frozen Ocean, are frequented by great numbers of these animals

The uses of the white bear are chiefly confined to the skin, the flesh, and the fat. Of these the *skin*, which is perhaps the most valuable part, is employed for beds, shoes, boots, and in various ways as leather. The *flesh* is eaten by the Greenlanders and the inhabitants of other northern countries, and is described to be as excellent as mutton; though this must be very doubtful when we consider the food on which these animals subsist The *fat* is melted and employed instead of oil: that of the paws is used in medicine, for anointing rheumatic and paralytic limbs, and was formerly esteemed a sovereign remedy for these diseases. Of the *tendons*, when split into slender filaments, the Greenlanders make thread to sew with.

White bears are killed with spears; and sometimes hunted with dogs, or killed with guns. They are savage, ferocious, and very powerful animals, almost always attacking mankind even when they are not themselves assault-

ed. Their usual food consists of seals, fish, and the carcasses of whales, as well as of all such land animals as they are able to attack and overcome. So great is their activity in the water that they are frequently known to swim over tracts of sea, several seven leagues, from one island or shore to another.

The glutton (*Ursus gulo*) is a small animal of the bear tribe, which has the back, muzzle, and feet of a dark brown colour, the sides dusky, and the tail of the same colour as the body.

It is about three feet in length, exclusive of the tail, and is a native of mountains and forests in the northern parts of Europe, Asia, and America.

In such esteem are the *skins* of these animals in Kamtschatka, that only the most wealthy of the inhabitants can afford to wear them; and females, when full dressed, ornament their hair with the paws. They indeed value this kind of fur so highly as to assert that the heavenly beings wear garments made of it, and no Kamtschadale can present to his wife or mistress a more acceptable gift than one of these skins. In Lapland they are sold at very high prices, and are used for muffs and the linings of coats. From the skin of the legs the Lapland women cut out gloves, which they work with a kind of tinsel wire, drawn through a machine made of the skull of the rein deer. The fur is of a glossy black colour, and shines with peculiar lustre, reflecting different shades of light, according to the different positions in which it is held. The *flesh* of these animals is sometimes eaten in Greenland.

It is said to be the habit of the gluttons to climb into trees, and drop from thence upon the backs of deer and other animals which happen to pass beneath, and on which they can prey. They also feed on hares, mice, birds, and even on the putrid flesh, and are said to be voracious in an extreme degree. They are so strong that three stout greyhounds are said scarcely to be a match for one of them.

The raccoon (*Ursus lotor*) is a slender and somewhat fox shaped quadruped belonging to the bear tribe, and is peculiarly distinguished by having a dusky stripe along the nose, and the tail marked with black rings.

This animal is chiefly found in the woods of North America.

The *fur* of the raccoon is so soft and useful as to be sometimes employed instead of beaver in the making of hats. It is also used for the linings of garments, and the *skins*, when properly dressed, make good gloves and upper leathers for shoes. The *flesh* is eatable.

The badger (*Ursus meles*) is a small animal of the bear tribe, which has coarse hair, of grey colour on the upper parts, and black beneath, and a long, black, pyramidal stripe on each side of the head; its body and legs are thick, and the teeth and claws peculiarly strong.

This animal is found in several of the woody districts of England, as well as in nearly all the temperate parts of Europe, and is about the size of a small pig.

In various particulars the badger is an useful animal to mankind. Its *flesh*, which is somewhat similar in taste to that of the wild hog, is much esteemed in Italy, France, and Germany, and may be made into excellent hams and bacon. The *skin*, when dressed with the hair on, makes excellent knapsacks, and covers for pistol furniture, and travelling trunks. For all these purposes it is frequently used, as it is impervious by rain, and needs no additional preparation to render it water proof. In the paralytic complaints of old persons it is asserted that the hairy skin of the badger, worn next to the body, has been of great service, by stimulating the inert vessels into action. The *hairs* or bristles are made into brushes for painters, and the *fat* is applied to many useful purposes both externally and internally, in medicine.

Badgers are generally caught in sacks fastened at night, when they are abroad in search of food, into the mouth of their burrows in the ground. When these are fixed, the animals are hunted home from the adjacent fields with dogs, and on entering their usual places of retreat to escape from their foes, they are immediately seized and tied up in the sacks by men who are stationed at hand for that purpose. Badgers are also sometimes caught by steel traps placed in their haunts.

These animals subsist principally on roots, and other vegetable food, which they scratch and root out of the ground during the night. Their dens or burrows are generally formed in woody places, or the clefts of rocks. Though in almost every respect innoxious, they are endowed with such strength as successfully to oppose the attacks of animals apparently much more powerful than themselves.

Bearsfoot, or Setterwort. See Stinking Hellebore.

BEARING, in navigation and geography, the situation of one place from another, with regard to the points of the compass, or the angle, which a line drawn through two places, makes with the meridians of each.

BEAVER, or *Castor*, a quadruped, of which there are three species

1 The *fiber*, or common beaver which inhabits the northern parts of Europe, Asia, and America, on the banks of rivers or lakes, at a distance from the dwellings of men, and is there a gregarious animal In populous countries, however, such as Germany, Prussia, and Poland, it is a solitary creature and the skin, on account of its constant residence under ground, is less valuable than that of the *social* beaver The latter is principally found in North-America, where many hundreds settle together on the bank of a river, and construct regular habitations, with admirable ingenuity, such as far excel the primitive huts and hovels erected by mankind They chiefly subsist on lobsters and other fish, and attain to an age of fifteen or twenty years The beaver's tail is from 6 to 9 inches long, and one inch thick, its flesh has the flavour of fish, and is esteemed as delicate food Near the rectum of both sexes, there are two little bags, about the size of a hen's egg, containing a brownish oily matter, called *castor*, which is a peculiar deposition of fat interwoven with the cellular membrane This substance has a disagreeable, narcotic smell, and a bitterish acrid, nauseous taste By drying it in the smoke of a chimney, it may be preserved for 7 or 8 years It has long been celebrated as a nervine and antihysteric medicine, though its efficacy has often been doubted Yet, we are convinced from experience, that the *genuine* castor affords an excellent remedy, and may be employed with advantage in languid habits, and such constitutions, in general, as evince neither a rigid fibre, nor a disposition to plethora. Even HIPPOCRATES prescribed it in hysteric cases and GALEN informs us, that ARCHIGENES had written a treatise on the subject This gelatinous and oily concrete is taken in doses from 5 to 20 grains, with sugar or its virtues may be extracted by water as well as spirit of wine, which latter forms a stronger preparation, but more heating than solid castor itself

In commerce a distinction is made between fresh, dry, and fat beaver-skins the first of these are obtained from animals caught in winter: the second from those killed during summer, the hair of which only is used in the manufacture of hats, and the third, or fat sort, are such as have been carried for some time on the naked bodies of the American Indians, who, as it were, tan the skin with perspirable matter. These furs are most valuable, while the hair of the others is manufactured into gloves, stockings, &c but that which is short and silky, is used for hats Each beaver, when full grown, is as large as a middle sized dog, and yields about 24 ounces of fine hair. The skin serves for covering saddles, trunks, and other articles

All those advantages, however, are not equivalent to the damage done by the beaver to the forests and sluices: and as they yearly become more scarce in America, while the price of their skin and hair advances, it is doubtful whether they ought to be spared, or exterminated

2 The *moschatus*, or water rat, of CLUSIUS is found in Lapland and Russia, on the banks of the Volga and Yaik it is devoured by pikes and other fish, to which it imparts so strong a flavour of musk, as to render them unfit for the table Its scent much resembles that of the former species, especially about the tail, from which the common Russians express a juice very similar to the genuine musk Hence, most of the castor sold in the London shops, consists of this inferior sort, or at least is much adulterated with it, so that the druggists themselves are frequently deceived

3 The *zibethicus*, or musk-rat of North America, the fur of which is much esteemed for its softness and beauty It is remarkable that, during summer, this animal has a most exquisite smell of musk, which it entirely loses in winter Probably this agreeable perfume is derived from the *Calamus aromaticus*, or sweet water flag, which is the favourite food of the musk rat See Artificial Musk

The Chilese beaver (*Castor huidobrius*) is a kind of beaver found in the province of Chili in South America, the under or short fur of which is very valuable This is manufactured into hats and into various parts of dress, and when properly dyed has nearly the beauty of velvet

BED, a convenience for ease, or sleep. It was the general practice in the first ages for mankind to sleep upon the skins of beasts

The most elastic straw is that of *barley*, which may be easily shaken and spread, when inclosed in ticking. Various unsuccessful attempts have been made to substitute the dry leaves of trees, moss, and other soft materials, instead of barley straw, which, however, is more eligible, or the leaves of Turkey corn, or maize, are still better.

The long moss of the live oak of Georgia answers very well, and is generally used for common mattresses.

A mattress filled with horse hair, is preferable to a feather bed, which heats and relaxes the body, and disposes it to pulmonary and hectic complaints. The bolster should be stuffed with horse hair, and covered with a small pillow filled with feathers. The bedding might consist either of sheets, with blankets and a counterpane, or a single cover, thinly quilted with cotton wool: the latter might be easily washed, and will last for several years. In very cold seasons, a counterpane quilted with a few pounds of soft feathers, might be substituted for the former, but it should not be used in summer.

BED, in masonry, a course of stones or bricks: the joint of the bed, is the mortar or cement placed between each range.

BED, in gardening, a division of the mould raised above the level of the adjacent ground, for the cultivation of plants or roots. See HOT-BED.

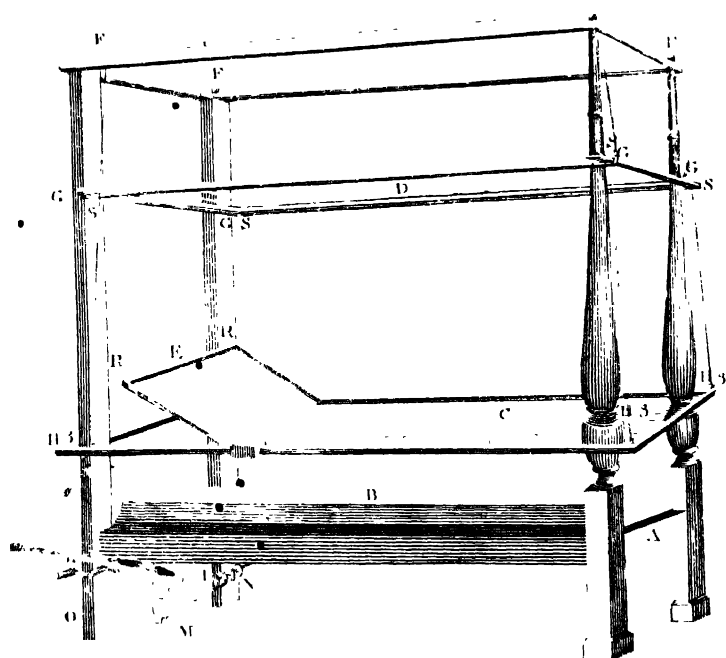
BED-ROOM, an apartment or chamber, devoted to the enjoyment of nightly repose, after the usual labour and fatigue of the day. Those happy few who, from their respective situations in life, are enabled to choose a spacious and lofty room for breathing in, at least, one third of their existence, may consider themselves peculiarly fortunate. It must, however, be confessed, that little attention is generally paid to this important object, even by such persons as might, in this respect, equally consult their health and convenience.

Small closets and concealed beds are extremely injurious, especially to young people and invalids. When persons are from necessity obliged to sleep in them, it will be advisable every morning immediately after rising, to displace all the bed-clothes, and, if the sky be serene, to open the door and windows, in order to purify the stagnant air of so confined a resting place. But we think it, on the whole, a dangerous practice to sleep with open windows, whether at night, or in the day-time, though a very small aperture, without admitting a current of air to pass through the room, may occasionally be useful. Nor should the bedstead be placed near a wall, or soiled linen be suffered to remain in an apartment where the purity of the air is of the first importance. A bed, or couch, ought to stand free on all its sides, and, if possible, in the middle of the chamber: which is further of consequence to timid individuals, who tremble during the prevalence of a tempest, or thunder-storm. We know from experience, that a flash of lightning, should it unfortunately strike a building, or enter through any of the windows, uniformly takes its direction along the walls, without injuring the furniture in the centre of a room.

BEDSTEAD, a frame for supporting a bed. Among the various materials used for bedsteads, iron is not only the most durable, but also the most beneficial, with respect to health. Oak is excellent for this purpose, being almost impervious to worms, if felled in the proper season, and allowed to become dry; but cedar, were it not for its strong odour, would be still more efficacious in preventing the inroads of bugs, or other vermin. Hence, the beams and posts of a bedstead, made of any hard wood, might be inlaid with cedar.

On this occasion we cannot, in justice to Mr. LAMBERT, of Berwick-street, Soho, London, omit to give a concise description of his newly invented BEDSTEAD for the SICK and WOUNDED, which is ably calculated to alleviate the painful situation of the aged, the infirm, or diseased. This ingenious contrivance, therefore, affords a comfortable accommodation to persons confined by fractures, gout, palsy, &c. It is particularly adapted to lying-in women. The bed may be made, and the linen changed, without, in the slightest manner, disturbing the patient, which renders it highly serviceable in camps and hospitals.

We have given a plate of this useful invention, of which the following is an explanation: *A*, the bedstead; *B*, the feather bed; *C*, the straining frame; *D*, the fracture frame; *S, S, S, S*, four rings in the fracture frame; *T*, the sleeping desk; *R R*, two rings in the sleeping desk; *F, F, F, F*, pullies put in motion by the machinery; *G, G, G, G*, receiving hooks of the fracture frame;



BEDSTEAD for the SICK & WOUNDED,

Invented by Mr. Lambert.

3 3 3 3, four rings in the straining-frame; *H,H,H,H*, receiving-hooks to ditto; *I*, the plate of the machinery; *K*, the great wheel; *L*, a pinion with a winch turning the great wheel; *O*, a pall or stop; *M*, a pinion with a fly, to prevent a too sudden descent; *N*, the rollers.

The subjoined directions should be attended to in making and using the bed. Lay the straining frame *C*, covered with ticking, on the feather-bed *B*, then the under-blanket and sheet: above these, place the fracture frame *D*, (on which the patient is supported;) then the bolster, pillows, and upper-clothes, in the usual manner. When the feather-bed is to be made, wind up the two frames, *C*, and *D*, by the winch, till the patient is supported above the bed, which may then be made, or, if necessary, another placed in its stead, and the two frames let down upon it.

In changing the linen, the two frames *C*, and *D*, must be wound up till they reach the four hooks *G,G,G,G*,: secure the hooks in the four rings *S,S,S,S*, and wrap the sheet you intend to remove, round the upper clothes, to exclude cold; let down the under-frame *C*; replace the blanket, and put on the clean sheet: draw away the other and again wind up the frame to the fracture-frame, and unhook it at the four corners Thus resting on the under frame, the patient safely descends to the comforts of a new made bed and clean linen.

As in the early stages of consumptive or asthmatic disorders, it is material to avoid the heat of a feather-bed, particularly if the patient be liable to night-sweats, and if he be able to rise and have the linen changed, the fracture frame may not be necessary: in this case, the lower frame may be wound a little above the feather-bed; at the top of the frame *C*, there is a sleeping-desk, *E*, by which the head and shoulders may be raised at pleasure, by fixing the two hooks at the end of the frame to the two rings, *R,R*, and freeing those at the feet: after which, by the use of the winch, it may be lowered or raised at pleasure

The whole apparatus may be attached to any four-post bedstead by a common carpenter.

It is needless to expatiate upon the utility of such a bedstead, to families at a distance from a metropolis: and as we have no personal acquaintance with the ingenious artisan, we cannot be suspected of partiality: indeed, the first account of his invention, together with a plate, was communicated to us by means of a foreign journal, lately imported.

Lastly, it deserves to be noticed, that the prevailing custom of providing the bedsteads of children with *curtains*, is liable to strong and serious objections: 1 Because they prevent a free access of air for the renewal of that mass which has been rendered unfit for respiration, 2 They endanger the lives of infants by candle light, from which fatal accidents have frequently happened; and 3 They are pernicious receptacles for the finest particles of dust, which, as we have already observed (see BED), are inhaled by the person confined within such curtains, on the least motion of the bedstead, and thence, perhaps, many young and blooming innocents may date the first period of their consumptive attack. We do not, however, mean to insinuate, that curtains ought to be universally abandoned, as there may occur a variety of instances, in which the laws of propriety and *decorum*, might render them useful and necessary.

BED-TIME, or that period of the evening or night, when we retire to enjoy the necessary repose

Although it would be difficult, in the present irregular state of society to lay down rules for the proper time of resorting to that place which suspends and makes us forget our daily troubles and cares, yet, when we consider the subject, with regard to its influence, as well on the health as the moral character of man, it is deserving of the most serious discussion. Much, indeed, depends on the arrangement of the day, and the different pursuits of the individual Those persons who spend the greater part of their time in useful labour, and have sufficient muscular exercise, would better consult their health, by retiring to repose at least two or three hours *before midnight*, which, according to the oldest and most accurate observers, are nearly as refreshing as double that portion in the morning. Those, however, who lead an idle and luxurious life, are too much the slaves of fashion, habit, and caprice to adopt any useful changes, which might abridge their amusements or imaginary comforts

On the other hand, the studious, and especially speculative persons, cannot comply with what are generally called "regular hours;" because their pursuits are better adapted to the solemn

stillness of night, while they indulge in reflections which require a connected series of thought, and reasoning, uninterrupted by the noise of day. Yet, even *literati* and artists, ought to pay due attention to this important circumstance, that the atmosphere of the night is always more vitiated, and consequently less fit for respiration, than that of a serene day; and as we respire a greater portion of air while awake, than in a sleeping state, it follows that the system must be more injured in the former than in the latter case.

Nor would it be proper to retire to rest immediately after a full meal, or in an agitated state of mind. Hence, two hours after a light supper ought to elapse, in order to prepare ourselves for an invigorating repose, and banish all gloomy or depressing ideas and thoughts which require mental exertion. For the same reason, we should remove from our sight every object which may irritate the nerves, and never adopt that pernicious practice of reading, till we fall asleep; an imprudence of which many young and thoughtless persons are guilty. Instead of such a dangerous expedient, it would be more salutary to walk up and down the room for a few minutes, or take any other gentle exercise.

Lastly, we are of opinion, that such individuals as breakfast at eight, dine at two, and drink tea at six; or, instead of this, eat a light supper between seven and eight o'clock, might with the greatest benefit to their health, retire to bed at eleven and rise at six o'clock in the morning, or earlier, according to the degree of exercise they have taken on the preceding day—See farther; SLEEP, SLEEPING, and WAKING.

BEE, or *Apis*, in natural history, a genus of insects, of which the *mellifica*, or domestic honey-bee, is particularly worthy of attention. It has a mouth furnished with jaws, and an inflected proboscis, with two bivalve sheaths; wings flat and without plaits, sting, in the female and neutral insects, concealed. The history of this insect is full of wonders, our limits will allow us to say but little. We shall begin with the new colony, which a hive sends forth about June. Before they come off, they commonly hang about the mouth of the hole, or door of the hive, for some days, as if they had not room, and were of themselves unwilling to stir. The swarm consists of three classes, one or more females, males, and drones, which are supposed to be of no sex. They commonly come off in the heat of the day, often immediately after a shower. At first they seem to fly about in great confusion, but they soon appear to be directed to some fixed place, and whenever the stand is made, they immediately repair to it till they are all collected. When they have fixed on a future habitation, they immediately begin to make their combs. The comb seems, at first to be formed for propagation, and the reception of honey to be only a secondary use. As soon as a few combs are formed, the female bee begins laying her eggs. From the time of laying, to the birth of the bee, the life of the maggot, and the life of the chrysalis, is shorter than in most insects. When they hatch, we find the young maggot lying coiled up in the bottom of the cell, surrounded with a transparent fluid. There is now additional employment for the labourers, viz. the feeding and nursing the young maggots. The maggots grow larger and larger till they nearly fill the cell, and by this time they require no more food, and are ready to be enclosed for the chrysalis state; when perfectly enclosed the insect begins to line the cell with a silk, which it spins out similar to the silk-worm, and which makes a kind of pod for the chrysalis. Having completed this lining, they cast off the last maggot coat which is deposited at the bottom of the cell, and become chrysalises. In this state they are forming themselves for new life, and are so entirely changed, that not the smallest vestige of the old form remains.

I. *Economy, Instincts, &c*

A hive of bees may be considered as a populous city, containing from fifteen to eighteen thousand inhabitants. This city is in itself a republic, where well ordered industry and perfect equality reigns. The combs are composed of pure wax, serving as a magazine for their stores, and a place to nourish their young. Between the combs there is a space sufficient for two bees to march abreast; and there are also transverse defiles by which the bees can more easily pass from one comb to another.

Drones are larger than the working bees; and when on the wing make a greater noise. They sicken, die, and are dragged from the hive, by the working bees about the latter end of July.

Several kinds of *working-bees* were distinguished by the ancients. COLUMELLA coincides with VIRGIL, in preferring those which are small, oblong,

smooth, bright or shining, and of a gentle disposition; the superior utility of this species has been established by experience. Working-bees compose the most numerous body of the state. They have the care of the hive; collect the wax and honey; fabricate the wax into combs; feed the young; keep the hive clean; expel all strangers, and employ themselves in promoting general prosperity. The working-bee has two stomachs; one to contain the honey, and another for the crude wax.

II. *Of the management of bees*, and the most approved methods of preserving them, on removing their honey and wax.

According to COLUMELLA, an *Apiary* should face the south, in a situation neither too hot nor too cold. It should stand in a valley, that the bees may with greater ease descend, on their return to the hive; and near the mansion-house, and situated at a distance from noise and offensive smells, and in the vicinity of a brook or river. Where the bees cannot have the benefit of running water, they ought to be supplied with it in a trough provided with small stones, on which they must stand while they drink. They cannot produce either combs, honey, or food for their maggots, without water; but the neighbourhood of rivers or canals with high banks, ought to be avoided, lest the bees should be precipitated into the water by high winds, and consequently perish. The garden in which the apiary stands, should be supplied with melliferous plants and branchy shrubs, that the swarms which settle on them may be the most easily hived.

Particular attention should be paid to the circumstance, that the bees be hived in a neighbourhood productive of such plants as supply them with food; such as thyme, the oak, the pine, fruit-trees, furze, broom, mustard, clover, heath, &c. PLINY recommends broom, as a plant particularly grateful and profitable to bees.

BEE HIVES made of straw, have been generally preferred, as they are not liable to be over-heated by the rays of the sun, keep out the cold better than wood, and are cheaper than those of any other material.

M. CHABOUILLE, in France, has lately suggested improvements upon bee-hives, which appear to us deserving of notice. His principal object is to procure the greatest degree of cleanliness for these delicate and industrious insects, by covering the bottom of the hive with plaster of Paris, and constructing the cylindrical inclosure of rye straw, and cross ligaments, or bands, made of the inner rind of the lime-tree. When the basket-work is completed, he coats it over with a cement made of two-thirds of cow-dung, and one third of ashes. In the interior part of the hive, he places two thin pieces of oak, crossing each other at right angles, which greatly facilitate the deposition of the honey-combs. The cover of the hive consists of a firm board, seventeen inches in diameter, and the entrance is so constructed, that it may be closed by a small door, to exclude injurious animals during winter. The lower part of this door has small semi-lunar incisions, each of which admits two bees abreast: above these, are made two rows of holes, just large enough for one bee to pass. The floor should be so constructed, that it may encompass and secure the foundation of the hive, to prevent any disturbance from that quarter. Such a smooth and white floor of gypsum, greatly contributes to cleanliness, and the bees become so much attached to it, that they will not easily relinquish their habitation. The straw wall ought to be one inch, and the cement before described, half an inch in thickness: the latter is the best coating yet contrived, for excluding noxious insects which would perforate the straw, and for sheltering the bees from rain and wind, while it exhales an odour very grateful to them. M. CHABOUILLE has also observed, that bees kept in a hive of this description, are sufficiently protected against the effect of cold during winter, and that they swarm much earlier than those reared in any other.

However ingenious this contrivance may appear, we regret that the inventor has not stated the particular dimensions of the bee-hive, nor attended to many other circumstances relative to the culture of the insect itself. Hence we are induced to communicate a later, more accurate and circumstantial description of a bee-hive, invented in Italy by professor GAETANO HARASTI, which has proved of practical utility. This account is translated from the *Transactions of the Patriotic Society of Milan*, and as it contains much useful information on the subject, we have endeavoured to render it of practical service, by accompanying it with the appropriate cuts of the different figures described.

It is well known that bees, when pre-

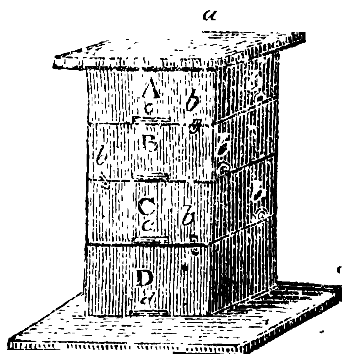
perly cultivated, produce considerable profit, and in order to obtain the greatest possible advantage, it is necessary to supply them with every convenience for the support of themselves and their young. We should also contrive means to take the wax and honey with the smallest possible loss. In short, when the apiary is placed in a good situation, (either south or south-west) that is, in a country abounding with flowers, at a distance from brew-houses, smelting works, &c. the next and most important point, is the choice of well constructed hives.

In Lombardy, the common hive, composed of straw or twigs, is generally used, though ill contrived; as it is difficult to take away the wax and honey without destroying the bees.

Reflecting on these circumstances, M. Harasti, during his cultivation of bees, conceived that it would be possible to form a hive which should have all the advantages of the best kind, while the simplicity and cheapness of its construction might bring it into use among husbandmen.

"A good bee-hive ought to possess the following properties: First, it should be capable of enlargement or contraction, according to the number of the swarm. Secondly, it should admit of being opened without disturbing the bees either for the purpose of cleaning it; of freeing it from insects, of increasing or dividing the swarm, or for the admission of a stock of provisions for the winter. Thirdly, it should be so constructed, that the produce may be removed without injury to the bees. Fourthly, it should be internally clean, smooth, and free from flaws. All these properties unite in the hive here described.

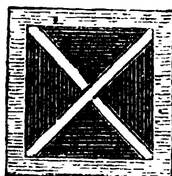
It is formed of four open square boxes, A, B, C, D, as represented by the following cut:



These boxes are fastened to each other by several wooden buttons, *b*, *b*, &c. which turn upon a nail or a screw. The whole is covered with a moveable roof, which projects over the boxes slanting from the centre *a*, that the rain-water may run off. It is necessary to place a stone on the top of the roof, to keep it on firm.

Instead of buttons, the boxes may be combined by a rabbet fastened with wooden pegs; but in either case, the conjoined parts should be closed with cement. If the swarm is not very numerous, three, or even two boxes will be sufficient. Each of them should be about three inches, or three inches and a half in height, and about six inches in the clear within. They should be made of wood, at least three quarters of an inch thick, that the bees, wax, &c. may be less affected by changes in the temperature of the atmosphere.

Within the boxes, at the upper part, there should be fixed two bars, in the form of a cross, with the extremities extending to the angles of the box, as is represented in the following figure



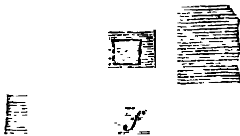
To these bars the bees attach their combs. At the lower part of each box, in front, there must be an aperture or door, as at *c,c,c,d*, as high as is

necessary for the bees to pass conveniently, and about an inch and a half wide; of these apertures, only the lowest (marked *d*,) is to be left open for the passage of the bees; the others are to be closed by means of a piece of wood, properly fitted to them.

It must be evident, that this bee-hive has all the advantages before mentioned. To lessen or enlarge it, only requires a diminution or increase of a number of the boxes; and a communication with the internal part can easily be effected by the removal of the cover.

The cheapness and facility of the construction of this hive is evident, as nothing is requisite but to join four boards with nails, or in any other manner, so simple that it may be done by a day-labourer.

When the hives are made, they should be placed in a good situation: the best is south-west; but they must not be too much exposed to the heat of noon, which may be mitigated by placing the branches of trees to shade the hives, as violent heat is injurious, not only to the bees, but to the wax and honey. The country around the apiary should be of a sandy soil, abounding with plants and shrubs. As bees love cleanliness and quiet, the circumjacent space should be kept clean, and free from offensive smells and noise: smoke is particularly disagreeable to them. The boards or table on which the hives are placed, should be dry, clean, and sound; and the hives ought to be sufficiently raised to prevent their exposure to dampness and insects; they should also be kept at a distance from a wall, to avoid the reflected heat of the sun. In the table on which the hives are to stand, there should be an aperture, under each, about two inches square, as it is represented at *e*, in the following cut:



This aperture should be covered with a piece of tin, drilled full of small holes, so as to afford a free passage to the air, and at the same time prevent the ingress of insects. That this may not occasion any inconvenience to the bees in cold and damp weather, there must be a sliding piece of wood, *f*, under the tin, by which the hole may be completely covered.

When it is intended to introduce a swarm of bees into a new hive, it must be thoroughly cleaned, and the inside rubbed with virgin wax. It is advantageous to place a piece of clean honey-comb, about nine inches long, in the hive, and care should also be taken to choose that which is made of very white wax. This piece being supported by a stick passed through it, offers to the bees a kind of nest, and excites them to continue their work.

The new hive being thus prepared, the manner of introducing the bees into it, from an old hive, is as follows: the latter must be placed upon one of the boxes of the new one; but as it will seldom happen that they are of the same size, and exactly fit each other, a board, at least as wide as the largest of the two hives, and which has a hole equal in size to the smallest, must be placed between them, and completely joined with cement, or by any other means, in such a manner as to be quite close, and to leave the bees no passage except into the new hive. As these insects generally work downwards, they will soon get into the new hive: and when it is occupied by about one-half of the swarm, some holes must be made in the top of the old hive, and kept covered, till the proper time for making use of them.

Every thing being disposed as above directed, we must take the opportunity of a fine morning (but not a very hot one), about eight or nine o'clock, at which time most of the bees are generally out of the hive, gathering their harvest. The comb is to be cut through, by means of a piece of iron wire, and the old hive, with the board on which it stands, is to be separated from the new one. An assistant must immediately place the cover (already well fitted) upon the top of the new hive. The old hive is then to be taken away, to the distance of thirty or forty paces, and to be there placed upon two chairs, or other supports, in such a manner as to be quite firm; but leaving a free space, both above and below, for the following purpose.

Upon this old hive (the holes at the top of it being first opened) is to be placed one of the boxes of the new hive, having the cover loosely fastened on it, so that it can easily be removed; this box must be fixed upon the old hive,

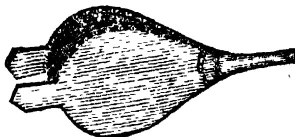
in such a manner (by closing the intervals between them with linen cloths, &c.) that the bees, upon going out by the holes in the top of the old hive, can only go into the new one. In order to drive them into it, some live coals must be placed under the old hive, upon which a few linen rags may be thrown, to produce a great volume of smoke. As the smoke rises, the bees being incommoded by it, will ascend to the top of the old hive, and at length will go through the holes into the new one. When all the bees, or nearly all, are gone into it (which may be known by looking in at the little door, or by their noise,) it is to be removed gently from the old hive, and placed under the box already alluded to, the top or cover being previously taken off. The next morning, if it should appear that the two boxes of which the new hive is now composed, do not afford sufficient space for the bees, a third box may be added, under the others; and after that a fourth, if necessary, as their work goes on, changing them from time to time, so long as the season permits the bees to gather wax and honey

In performing the operations here described, it will be necessary to defend the hands and face from the stings of the bees The best way of doing this, is to cover the whole of the head, neck, &c. (over a hat) with coarse cloth, or canvas, which may be brought as low as the waistcoat, and fastened to it: through this cloth we may see the operations of the bees, without fearing their stings The hands may be protected by means of gloves, of which the best are those made of wool.

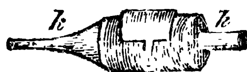
When we mean to bring a new swarm into a hive, that prepared as above, and formed of two, three, or four boxes, according to the size of the swarm, must be brought near the place where the swarm is. The upper box, with the cover fastened on (but so that it may easily be removed,) must be taken from the others. The cross bars, before described, should be smeared with honey, diluted with a little water; the small door must be shut; and the box must be turned upside down, and brought under the swarm, which is then to be introduced, in the same way, and with similar precaution as into a common hive. When the whole swarm is in the box, it is to be carried to the other boxes (previously placed in their destined situation), and, turning it very carefully, is to be put upon them The buttons are then to be turned, the interstices closed with the cement already described, and all the little doors closed, except the lowest, through which the bees are to pass. Nothing is more disagreeable to a fresh swarm than a hot sun, for which reason, that the bees may not wish to leave their new habitation, it will be right to shade the hive for some days

But it is more advantageous to form artificial swarms, than to collect those which abandon their native hives, and the hive here described is very convenient for that purpose. The following method, M. HARATI conceives to be more simple, and more secure than any other hitherto proposed.

Take a well stocked hive, of four boxes; in some of these, particularly in the two lowermost, if they are well filled, there is certainly a young brood; for in these lower boxes the young bees are accustomed to change from the chrysalis to the perfect state, about the end of April, or beginning of May, if the hive be very full; but if otherwise, this change does not take place till towards the end of May, or even the middle of June At that time, a fine serene day, but not excessively hot, must be chosen, and about eight or nine o'clock, the hive must be divided into two, in the following manner: Between the two upper boxes and the two lower ones, force in a few slips of wood, so as to separate the boxes sufficiently for the comb to be cut through with a piece of iron or brass wire To prevent the bees from coming out through this opening, and thereby annoying the person employed in the operation, the smoke of tobacco may be blown (by introducing the small end of a pipe) into the opening; this will cause the bees to resort to the inner part of the hive, and will keep them quiet. Or, instead of the pipe, a small pair of bellows



may be used, to the nozel of which is fitted a hollow cylinder of tin,



or other metal, furnished with a little door *i*, and terminating at one end in a tube *h*, (into which the nozzle of the bellows is fitted) and at the other end, in a smaller tube *k*, through which the smoke is to pass. Into the body of the box, through the door *i*, is to be put a lighted rag, the smoke of which may be blown, by means of the bellows, into the hive. But, if the hands and face are well covered, these precautions are unnecessary. An empty box must be in readiness, in the place where the hive is to stand: a cover must also be procured; and, as soon as the hive is divided in two parts, the two upper boxes must be taken from the lower ones, and the cover must be immediately put upon the latter, closing all the interstices with the usual cement. The upper boxes are to be placed upon the empty one just mentioned, so that a hive will there be formed of three boxes. The lower boxes, on which the fresh cover was put, must be left at rest till the evening, at which time a third may be placed under them; and when it appears that a proper quantity of work has been done in the lower box (of either hive,) a fourth box may be added, under the others.

In the above manner, artificial swarms may be formed; and, by this method, we not only avoid the inconveniences which attend the procuring of swarms in the common way, but we obtain the advantage of having the hives always well stocked. This ought to be the first object of every one who cultivates bees; for it is allowed to be of more advantage to keep the hives well stocked, than to increase their number; and, in fact, it has been observed, that if a hive of 4000 bees gives six pounds of honey, one of 8000 will give twenty-four pounds.

Upon this principle, it is proper to unite two or more hives, when they happen to be thinly stocked This may easily be done, by taking a few handfuls of balm, and scattering it in those hives which are intended to be united. By this means, the bees will all acquire the same smell; and it has been observed, that by the sense of smelling, bees distinguish those which belong to the same hive. After the above preparations, the hives are to be joined, by placing them one upon the other, in the evening, when they are at rest, taking away those boxes which contain few or no bees. Care must be taken to shut all the little doors, except the lowest

It may even be proper sometimes to shut the lower door also, when, for instance, any tumult within the hive, causes the bees to endeavour to quit it. In such case, that the bees may not be deprived of air, a piece of tin, perforated with numerous holes, may be used to close the opening, instead of the usual door, and may be taken away when the bees become quiet.

The following is the method of taking the wax and honey, with little or no injury to the bees; but it should be previously remarked, that the honey is chiefly at the top of the hive, the young brood in the middle, and the greatest stock of wax is at the bottom For this reason, when three of the four boxes are filled with comb, &c. the upper one A, is to be first taken off, in the manner here described. The buttons, *b,b,* &c. which serve to unite the boxes, are to be turned, or the wooden pegs (if such are used) taken out: the cement employed for closing the intervals is to scraped off; and then a piece of iron wire is to be drawn through the comb so as to divide it. When the box, A is separated, its cover is to be taken off and put upon the box B, now become the highest. After taking out the contents of the box A, it is to be cleaned, and again placed upon the stand or table, under the box D, taking care to open its little door, and to shut that of the box D. To prevent any bees remaining in the upper box, when taken away, a little smoke may be introduced by means of the bellows already described.

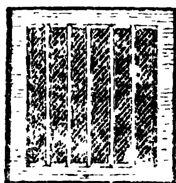
The more empty space the bees find in the hive, the more eagerly they go to work The brood of the box B, which remained at top, do not long delay to swarm, or at least they pass from the state of chrysalis into that of the perfect and laborious animal; therefore, when it is perceived that the lower part of the hive is occupied, the box B, may be taken off, in the manner already described, and after being emptied, may be placed under A.

In the same way the third box C, in which there is generally a good stock of wax, may afterwards be taken off; but this is a matter of greater consequence, because in general the eggs are deposited in it. We must also take care not to deprive the bees entirely of the stock of wax and honey which they have collected for the winter.

A hive made in the manner here pointed out, appears to me to be such as

would be most useful to husbandmen in general, who wish to cultivate bees; but a hive may be made upon the same principles, which will shew the work of the bees, through its whole progress, and thereby enable any one to study the natural history of these wonderful insects.

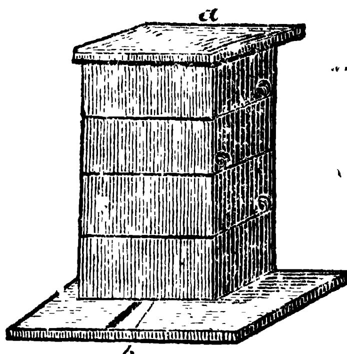
A hive of this kind is composed of three or four boxes, with a cover, like the hive already described; it may also be of the same form and size. But in every box, on that side which is opposite the little door, there must be fixed a pane of glass, with a sliding shutter over it, so that by drawing back these sliders, the inside of the hive will be exposed to view. To see the bees at work, however, it is necessary that the comb should be disposed in a regular manner, and perpendicular to the pane of glass. This may be obtained, by placing in the boxes, instead of the two cross sticks already described, in page 178, five parallel sticks or bars, as represented in the following figure:



The bees will attach their combs to these bars, and the intermediate space will afford sufficient light for seeing them work. If more light is desired, it may be obtained by opening the little doors opposite the glass; which doors may be made considerably higher than is above directed, and may have a slider over them, by which their aperture may be diminished at pleasure.

The sliders which cover the panes of glass, ought never to be opened, except for the purpose of observing the bees; because a strong light lessens their disposition to work. If it should be perceived that the coldness of the glass is prejudicial to the bees in winter, it may then be covered with a cotton cloth; or it may be entirely taken away, and a piece of pasteboard put in its place, for at that time the operations of the bees are suspended.

Instead of making a little door to each box, to be left open when the box is lowermost, for the passage of the bees, perhaps it might be better (because more simple) to cut a groove in the board or table on which the hive is placed. This groove should be about two inches wide, and about three fourths of an inch high at the outer edge, and should be gradually diminished both in width and height, towards the part where it meets the hive, as is represented at *b*, in the following figure:



Two advantages are derived from this construction. First, the little door in the box, and the contrivance for opening and shutting it will be unnecessary. Secondly, it is sometimes proper to diminish or enlarge the opening for the passage of the bees, according to circumstances, without shutting it entirely, and this may be done with the greatest ease, by moving the hive nearer to, or farther from the edge of the table; or this passage may be entirely closed, by moving the front of the hive beyond the groove; but in

that case some small holes must be made in the hive to let in air, which may be stopped up when that formed by the groove is open.

A farther advantage attending this construction is, that as the groove will have a slanting direction, the bees will thereby be enabled, with very little trouble, to remove from the hive any dead bees, excrement, &c, which may be obnoxious to their nature.

Another very curious and useful bee-hive, is that originally contrived by Mr THORLEY, of London, which, from near sixty year's experience, has proved of superior utility to any other. It is constructed as follows: the lower part is an octangular box, made of deal boards, about an inch in thickness, the cover of which is externally seventeen inches in diameter, but internally only 15½, and its height ten inches In the middle of this cover is a hole, which may be opened or shut at pleasure, by means of a slider In one of the pannels is a pane of glass covered with a wooden door The bee-hole at the bottom of the box is about 3½ inches broad, and half an inch high. Two slips of deal, about half an inch square, cross each other in the centre of the box, and are fastened to the pannels by means of small screws. To these slips the bees fasten their combs In this octangular box the bees, after swarming in the usual manner, are hived, and suffered to continue there, till they have built their combs, and filled them with honey, which may be known by opening the door, and viewing their works through the glass pane, or by the weight of the hive. When they have filled their habitation, a common bee-hive of straw, made either flat at the top, or in the common form, must be placed on the octanguiar box, and the slider drawn out; thus a communication will be opened between the box and the straw-hives, so that these industrious insects will fill this hive also with the product of their labours. When the straw-hive is sufficiently filled, the slider may be pushed in, and after placing another in its room, again speedily removed.

Mr. THORLEY has added another part to his bee-hive, which consists of a glass receiver, 18 inches in height, 8 inches in diameter at the bottom, and in the greatest part 13. This receiver has a hole at the top, about an inch in diameter, through which a square piece of deal is extended to nearly the bottom of the vessel, having two cross bars to which the bees fasten their combs. Into the other end of this square piece, is screwed a piece of brass, which serves for a handle to the receiver, or glass-hive. When the bees have filled their straw-hive (which must have a hole in the centre, covered with a piece of tin) Mr. T. places the glass receiver upon the top of the straw-hive and draws out the piece of tin. The bees now, finding their habitation enlarged, pursue their labours with such alacrity, that they likewise fill this glass hive with their stores.

The Egyptian bee-hives are made of coal-dust, and clay, which being well blended together, the mixture is formed into a hollow cylinder, about a span in diameter, and from six to twelve feet high: this is dried in the sun, and becomes so hard that it may be handled at pleasure.

Another, of a very simple and ingenious construction, has been invented by M DE GELIEU. It may be made either of straw or wood: but, as its internal dimensions must be the same throughout its whole length, it is necessary that its form should be either cylindrical or prismatic. Its principal advantage is, that its bases are moveable, and may be fixed by pins at any distance from each other; by which means its size may be increased or diminished according to circumstances. It must lie on its side, and, in the foremost base, there must be a passage left for the bees Hence, by drawing out the posterior base, the honey may be taken from the back part of the hive, without hurting the bees; and when this is done, the base should be pushed in close to the remaining comb, that an intermediate space may remain. By turning the hive, and making the entrance in that part, which had before been the posterior base, the bees will build new cells, in the room of those taken away; consequently the honey will be whiter, and more pure.

Whoever intends to erect an apiary, should purchase hives towards the close of the year, when they are cheap, est; and such only as are full of combs and stocked with a sufficient number of bees. In order to ascertain the age of the hives, it should be remarked, that the combs of the last year are white, while those of the former year acquire a darkish yellow. Where the combs are black, the hive should be rejected as too old, and liable to the inroads of vermin.

Bees never swarm till the hive is too much crowded by the young brood. They sometimes begin to swarm in May, or earlier, according to the warmth of the season. As soon as a swarm is settled, the bees should be immediately hived, to prevent their taking wing again. If they settle on a low branch of a tree, it may be cut off and laid on a cloth, the hive being ready for their reception; but if it be difficult to reach them, it will be advisable to let them remain where they have settled till the evening, when there will be less danger of their escaping.

When the swarm is hived, they should be immediately removed to the apiary, but the hive should be kept near the place at which the bees settled, till the evening, lest some stragglers might be lost.

The usual method of uniting swarms is by spreading a cloth at night upon the ground close to the hive in which the two swarms are to be placed. Lay a stick across the cloth, on which place the hive with the new swarm: on giving a smart stroke on the top of the hive, all the bees will drop in a cluster upon the cloth. Then take another hive from the stool, and place it over the bees, when they will ascend into it, and mix with those already there. Another method is, to invert the hive in which the united swarms are to live, and strike the bees of the other hives into it, in the manner before described.

A large swarm weighs eight pounds, and others gradually less, to one pound. Hence a good swarm should weigh five or six pounds. Such as are less than four pound's weight, should be strengthened by a small additional swarm The size of the hive ought to be proportionate to the number of the bees, and it should be rather too small than too large, as these insects require to be kept warmer than a large hive will admit.

Great improvements may be made in providing plenty of pasture for bees; and as a rich corn country is unfavourable to their industry, the practice of other nations, in shifting the abode of their bees, is deserving of imitation.

M Maillet, in his description of Egypt, informs us, that the natives of that fertile country annually send their bees into distant regions to procure sustenance for them, when they cannot find any at home. About the end of October, the inhabitants of Lower Egypt, embark their bees on the Nile, and convey them to Upper Egypt, when the inundation is withdrawn, the lands are sown, and the flowers are beginning to bud. These insects are thus conducted through the whole extent of Egypt, and, after having gathered all the rich produce of the banks of the Nile, are re-conducted home about the beginning of February

In France, floating bee-hives are very common. One barge contains from 60 to 100 hives, which are well defended from the inclemency of the weather. Thus the owners float them gently down the stream, while they gather their honey from the flowers along its banks; a single bee-house yields the proprietor a considerable income.

Their method of transporting bees by land, is also worthy of our attention. The hives are fastened to each other by laths, placed on thin pack-cloth, which is drawn up on each side, and then tied by a piece of pack-thread several times round their tops. In this state they are laid in a cart, which generally contains from thirty to fifty hives, and conveyed to places where the bees can collect honey and wax.

During the winter, bees are in so lethargic a state, that a little food is sufficient for their sustenance; but as every sunny day revives, and prompts them to exercise, food is necessary on these occasions. Some hives of bees which are supposed to have died of cold, have in reality perished by famine, especially when a rainy summer prevented them from collecting a sufficient store of provision Hence the hives should be carefully examined in autumn, and ought then to weigh at least eighteen pounds each.

With respect to the feeding of bees, the common practice is, to leave them as much honey in autumn, as will make the hive weigh 20 pounds. The honey should be diluted with water, and put into an empty comb, split reeds, or upon clean wool, which the bees will suck perfectly dry. By the dilution with water, however, the honey is apt to become candied, in which state it is prejudicial to the bees A better method is, to replenish the weak hives in September, with such a portion of combs filled with honey taken from other hives, as may be deemed a sufficient supply. This is done by turning up the weak hive, cutting out the empty combs, and placing full ones in their stead, secured by pieces of wood, that they may not fall down when the hive is replaced. If this method be considered too troublesome, a plate of ho-

ney, unmixed with water, may be placed under the hive, and straws laid across the plate, covered with paper perforated with several small holes, through which the bees will suck the honey without difficulty.

The degree of cold which bees can endure, has not been ascertained. In the cold parts of Russia, they are often found in hollow trees. Their hives are frequently made of bark, which does not afford them much protection. Hence, Mr. WHITE observes, that bees which stand on the north side of a building, will not consume more than one-half of the honey necessary to supply others which stand in the sun. In winter, however, they should be examined; and if, instead of being clustered between the combs, they are found in numbers at the bottom of the hive, they should be carried to a warmer place, where they will soon recover. In winters extremely severe, lay on the bottom of an old cask the depth of half a foot of very dry earth, powdered, and pressed down hard. On this, place the stool with the hive; and, to preserve a communication with the air, cut a hole in the cask, opposite to the entrance of the hive, in which fix a piece of reed, or hollow alder, and then cover the whole with dry earth.

In Britain, it is usual, in taking the honey, to deprive the bees of their lives. The common method is, to suffocate them with the smoke of brimstone; but Mr. MANLEY has adopted a more humane and judicious plan: he says, "I never destroy the old stock of bees: but, after lifting them, to examine what honey there is, if I think the hive is full, I put another under it with a flat top, having a square hole in the centre. When the bees are in the under hive, I place a shutter, which is of wood, in the hole of the top; and that prevents them from going into the upper hive. I then invert it in a bucket, and strike it with a rod till I think they are all out, after which they go into the under hive."

Mr. WILDMAN gives the following instructions for taking the honey and wax: remove the hive into a darkened room, that it may appear to the bees as if it was late in the evening; then gently invert the hive, and place it between the frames of a chair, or any other steady support, and cover it with an empty hive raised a little towards the window to give the bees sufficient light to guide their ascent. Hold the empty hive, steady supported, on the edge of the full hive, between the left side and arm, and continue striking with the right hand round the full hive, from the bottom upwards, and the bees being frightened by the noise, will ascend into the other. Repeat the strokes, rather quick than strong, round the hive, till all the bees are gone out of it, which will be in about five minutes. As soon as a number of the bees have got into the empty hive, it should be raised a little from the full one, that they may not return, but continue to ascend. When they are all out of the full hive, that in which they are must be placed on the stand, to receive the absent bees as they return from the fields.

The combs should be cut from the sides and top as clean as possible, to save the future labour of the bees. During this operation, the hive should be placed, reclining to the side from which the combs are taken, and afterwards put for some time upright, that the remaining honey may run out.

Having finished the taking of the wax and honey, the next business is to return the bees to their old hive, for which purpose we must refer the reader to the directions already given, when we stated the usual method of uniting swarms.

By inverting the hive which contains the bees, and placing their own over it, they will immediately ascend, especially if the lower hive be struck on the sides to alarm them.

With regard to the increase of bees, Mr. HUBBARD, of Bury St Edmunds, England, advises the owner to wait with patience, until he has acquired twenty stocks, and in the month of April to separate ten of the strongest hives for swarming; the other ten must be raised on large empty hives, the tops of which should be previously taken off, and the joinings of the two hives secured with a little clay, which plan prevents the bees from swarming. He also recommends the prime swarms from the other stocks, to be put into three-peck hives at least: for, when they appear very early, they will probably swarm again in a few weeks, which should always be prevented, and all the after-swarms be united, two or three into one; for the great advantage arises from a large quantity of bees being kept together; and by that mode, ten stocks will generally yield fifteen good ones.

The following observations were published by GEORGE MORGAN, Esq. formerly of Princeton, New-Jersey.

"Several writers on the management of bees, have given very ingenious directions for taking their new made honey, without destroying those useful creatures My humanity, hurt at the idea of setting fire to the fatal match, induced me to imitate their methods; particularly those o Mr. WILDMAN, and the Rev Mr. WHITE, whose directions I observed very attentively, with some success; but my expectations were not gratified, as I found young broods in every hive I took, and consequently the honey obtained was impure. However, after a variety of experiments, I discovered an agreeable, safe, and easy way to take the honey, without the least injury or disturbance of the bees.

As I have experienced great pleasure, and some benefit from my discovery, I take this opportunity to lay it before the *Agricultural Society*

My boxes are made, after the manner of Mr. WHITE's, of any well seasoned wood, ten inches square in the clear, in pairs, with communications at the sides, for the bees to pass freely from one box to another: a pane of glass (7 by 9) with a sliding shutter, may be put into the back part of each box, through which you may see the bees at work. Any person who can handle a saw and hammer, may make the boxes at a small expense.

The communication between the boxes are at top and bottom; those at top should be 3 inches long, and ½ an inch wide, to serve as streets or alleys betwixt the hives

The communications at bottom should be five or six inches long, and three-fourths of an inch deep, so as to afford a free passage from one hive to the other.

The mouth of the hive may be from three to ten inches long, and half an inch deep In the busy season, this wide entrance facilitates the bees going out and coming in, and may be contracted at pleasure in autumn.

Early the next morning after having a swarm of bees in one of these boxes, I add another to it, the door of which I close until the bees begin to work in it; when I open it to facilitate their industry.

Each box, of the above dimensions, will contain thirty pounds of honey. An early swarm, in a favourable situation and season, will fill two boxes, and cast out several swarms; each of which will fill two boxes with honey.

As winter approaches, all the bees collect themselves into one box, and will leave the other, with its contents, to the use of the owner, whose profit, in good seasons, will be 90 lb. of honey, and several additional swarms, for every stock kept over the preceding winter; 15 or 20 lb. of honey are sufficient to keep a stock over our longest winters, but I leave them 30 lb.

Thus I acquire the purest honey, without the use of the match, or any trouble in dividing or disturbing the bees; for on turning up the hives (which have no glasses) I discover, immediately, that in which the bees are collected, and I carry off the other, without a single bee in it.

The losses and disappointments I have met with in a great variety of experiments, induce me to recommend this management to every lover of bees, as I have found it easy, pleasant, and profitable"

It ought to be observed, that all honey is not wholesome. Bees indiscriminately sip the flowers of all plants abounding with sweets; and as some of these plants are of a poisonous nature, it follows that the honey must partake of their injurious qualities Dr. BARTON has written a very excellent paper on this subject. *Amer Phil. Trans* vol 5th. The plants affording this poisonous honey are, *kalmia angustifolia*, or dwarf laurel; *kalmia latifolia*, or great laurel; *kalmia hirsuta*, a pretty little shrub of the southern states; *andromeda mariana*, or broad-leaved moorwort As these are very plentiful in many of the American forests, their blossoms afford much honey for the wild bees.

Dr. B. thinks that it will be found that other plants yield unwholesome honey; such are, 1 *Rhododendron maximum*, or Pennsylvania mountain laurel; *azalea nudiflora*, or wild honey-suckle; and *datura stramonium*, or James-town weed. The four first mentioned plants ought to be extirpated in the neighbourhood of bee-hives; and the honey procured from the three enumerated in the second place as suspicious, should be carefully examined to determine the fact with regard to them.

The manner of treating bees in *Portugal*, is as follows: A spot of ground is chosen for the hives, exposed towards the south or south-east, well sheltered from the northern blasts, and surrounded with shrubs and flowers of

the latter, rosemary is preferred. The richer the neighbouring grounds are, the better; for bees are said to range for food to the distance of a league from their home Lanes are cut through the shrubby thickets, of five or six feet wide. The fences between the lanes are about the same dimensions, and formed at intervals into small recesses, like bowers or niches, to receive the hives.

The Portuguese hives, in general, are of a cylindrical form, and about twenty-seven inches high by fourteen in diameter. They are constructed of the rind of the cork tree, and covered with an inverted pan of earthen ware, the edge of which projects over the hive like a cornice The whole is fastened with pegs made of hard and durable wood, and the joints cemented with peat. In the front of the cylinder, at the height of about eight inches, there is a small aperture, where the bees enter. The inside is divided into three equal compartments, which are separated by cross sticks, on which the bees form their combs, or cells.

When they swarm, which is usually in May or June, the hives are placed to receive them, where they settle. If, on attempting to collect them, they fly away, a sheet is placed at night on t ground, contiguous to the swarm ; and when they alight, the hive is put over them, with the entrance closed ; then the whole is covered with the sheet, in which they are carried home. The honey-combs are taken out in June, during the heat of the day, but not if a high wind prevail, or at the commencement of a new or full moon. A person holds a chaffing dish, with a coal fire, covered with moist peat, to increase the smoke; which being introduced among the bees, from the top of the cylinder, they either escape, or remain intoxicated at the bottom ; then the hive is taken to pieces, by drawing out the pins. The combs, except two cells around the hive, are cut out, without destroying the bees, and the incision is covered with pulverised clay. It is not advisable to remove them, until they be full of honey.

In this country, at former periods, many artificial methods have been invented and practised, with a view of stimulating the industrious bee to still greater exertions, and thus to increase the production of honey. Although we are no advocates for such schemes, nor do we give credit to the marvellous reports circulated to confirm their success, yet we consider the recipe given by the late Prof BRADLEY, in his *Family Dictionary*, sufficiently curious, if not practically useful, to communicate it to our readers: Take a handful of sweet yeast, one drachm of camphor, half a drachm of musk dissolved in rose-water, a sufficient quantity of yellow bees-wax, and oil of roses (which, last, however, being an expensive article, may be safely omitted), pound the first two ingredients well together, and put them into the melting wax; then add the oil of roses, and make it up into a mass, which should be cool, before the musk is incorporated with it. Of this composition, place a piece of the size of a hazel nut at the side of a hive, and it will be found, that it not only increases the number of the bees, but also enables them to improve the honey, in the proportion of three to one. Yet the learned editor does not inform us, whether this improvement is productive of a superior quality, or larger quantity of honey, or perhaps of both.

With respect to the *Diseases of Bees*, we shall mention a few hints, extracted from the above-mentioned work

Bees are sometimes afflicted with a diarrhœa, in consequence of feeding greedily on the blossoms of the milk-thistle, and elm. The best cure is, pounded pomegranate seed and honey, [illegible]ed with rich, sweet wine; or raisins mixed with similar wine or mead, in which rosemary has been boiled. When they are infested with vermin, the hive must be cleansed, and perfumed with a branch of pomegranate, or the wild fig tree, which will inevitably destroy them.

Butterflies are said to conceal themselves in the hives, and annoy the bees: these intruders may easily be exterminated, by placing lighted candles in deep tin pots between the hives; as the flame will attract them, and conduce to their destruction.

In order to extirpate hornets preying upon the honey, it is only necessary to expose shallow vessels near the hive, with a little water; to which these predatory insects will eagerly repair, to quench their thirst, and thus easily drown themselves.

To prevent bees of one society from attacking or destroying those of another, Dr DARWIN recommends a board, about an inch thick, to be laid on the bee-bench, and the hive to be set on this board, with its mouth exactly on the edge; the mouth of the hive should also be contracted to about an inch in

length, and a semi-circular hollow made in the board, immediately under the mouth of the hive. By this simple method, the assailing bees will be constrained to act with great disadvantage.

If, however, this should not succeed, Dr. DARWIN advises a removal of the bee-hive to a distant part of the garden, and to a more easterly aspect; as he has from experience observed the good effects of such a change. This acute philosopher farther observes, in his admirable "*Phytologia*," when treating of the glands and secretions of vegetables, that the depredations of insects committed on that nutricious fluid, *honey*, is probably injurious to the products of *vegetation*; and that some plants are more exposed and accessible to bees than others, which are either better defended, or secrete a greater portion of honey than is necessary for their own economy. Of the latter description are, the catch-fly, sun-dew, hellebore, and aconite: of the former, the Doctor mentions the *Polygonum melampyrum*, or Buck-wheat, and the *Cacalia suaveolens*, or Alpine Colts-foot; in both of which there also appears to be a superabundant quantity of honey secreted. The flowers of the two last-mentioned plants are perpetually loaded with bees and butterflies; insomuch, that at Kempton-land, in Germany, Mr WORLIDGE says, in his "*Mysteries of Husbandry*," chap. ix 3, he saw forty great bee-hives filled with honey, to the amount of *seventy pounds each, in one fortnight*, by their being placed near a large field of buck-wheat in flower: and Dr DARWIN adds, that he well remembers having seen an astonishing number of bees on a field of buck-wheat in Shropshire, as well as on a plant of the Alpine Colts-foot in his garden; from which the scent of honey could be perceived at several feet distance from the flower.

To conclude this interesting subject, we cannot omit the judicious remarks of a veteran writer, Dr. J ANDERSON, whose numerous and useful works, in every branch of rural and domestic economy, are of inestimable value to the farmer. In one of his practical papers "*On the Management of the Dairy*" communicated to the *Bath and West of England Society*, he observes in a note, that bees, in that variable climate, are a very precarious stock, though extremely profitable where they thrive. During the frequent mild days of winter, and the warm mornings of spring, which are suddenly succeeded by a nipping frost, or sleety rain, these creatures are roused from their torpid state; and, being unable to obtain food abroad, they are obliged to consume and exhaust their stores, and to perish from want. And as the warmth of the weather in spring invites them to search in vain for flowers affording them nourishment, they are often chilled by cold, before they are able to return to the hive. To prevent such fatal accidents, Dr. ANDERSON is of opinion, that no method would be so effectual as that of placing the hives in an ice house, at the approach of winter. Here they may be kept till the spring has so far advanced, that no danger is to be apprehended from bad weather. During the whole winter, they will remain in a state of torpor, and require no food. As soon as the mild weather incites them to appear, they will commence their labours with vigour. The intense degree of cold which the bees sustain, without the least injury, in Poland and Russia, where even quicksilver is sometimes frozen, removes every doubt, or anxiety, concerning the safety of bees in an ice-house.

BEES-WAX, a solid concrete, obtained from the honey-combs, after the sweet and liquid parts are extracted, by heating and pressing them between iron plates. The best sort should be hard, compact, of a clear yellow colour, and an agreeable odour, similar to that of honey. Pure bees-wax, when new, is tough, yet easily broken; by long keeping, it becomes harder and more brittle, loses its fine colour, and partly also its fragrance.

[Wax is bleached by being melted and poured on a cylinder, which is kept turning in a vessel of cold water; the wax is thus formed into thin ribands, and in a proper state to be laid down on the grass to bleach.—T C.]

The purposes to which bees-wax is applied, are various: great quantities of it are annually bleached, and converted into candles. On account of its softening and healing nature, it is much used in cerates, plasters and ointments.

[Half an ounce of bees-wax and a quarter of an ounce of rosin, dissolved in a pint of oil of turpentine, will make a liquid that renders cloth impervious to water. Its fault is, attracting dust —T C.]

Artificial wax may be extracted from many vegetable substances; especially from the flowers of the lime tree, by a chemical process; but we doubt whether the expense attending this experi-

ment would, in this country, be equivalent to the advantages. It is, however, certain, that *wax* is contained in a much greater number of vegetables than has hitherto been supposed; and it may easily be extracted from the leaves of most plants and trees, as is manifest from their shining cover or varnish, which generally consists of waxy matter. This concrete also forms an ingredient of several resins; and may be separated from gummy, mucilaginous, and saccharine matters, by simple water: from saponaceous substances, by water or spirits of wine; and from resinous bodies, by means of vitriolic æther.

Bee-Bread is a species of crude wax, collected by the working-bee from the farina of flower-cups, conveyed to the hive in the hollow of its hind-legs, and deposited in the cells with the egg, to serve as food for the young maggot.—This substance often varies in colour, according to the different flowers from which it is separated; and though generally white at first, it is afterwards changed, by the impurities arising from the steam, &c of the bees. In some hives, this crude wax is said to amount to one hundred weight in a season, if the total consumption of the voracious young maggots be calculated in proportion to the incessant labour of their supporters; though the real wax in the whole hive may perhaps not exceed two pounds weight.

Bee-Glue, formerly called Virgin-wax (*Propolis*,) is another balsamic production of the bee, which deserves to be noticed: it is a kind of natural mastich, of a reddish colour, and very agreeable smell. Small pieces of it are frequently found in the holes and crevices of the hives, where it is employed by those little artists, as a cement for excluding cold, rain, and noxious insects.

In the immense forests of Poland and Russia, where bees select their own habitations in the hollow trunks of trees, the bee-glue is deposited in much larger pieces, and of a superior flavour, to what is obtained in countries where these insects are reared by the aid of art. The inhabitants of the former, generally used it as a vulnerary application, to promote the healing of fresh wounds. Dr. James, in his "*Medicinal Dictionary*," praises the bee-glue as being gently heating, abstergent, and attracting: it softens indurated parts, alleviates pains, and induces cicatrices on ulcers.

Stings of Bees are more virulent than even those of wasps, and sometimes attended with very violent effects. As the sting is barbed, it is always left in the wound. When, therefore, a person is stung by a bee, the sting should be instantly extracted; for, by its peculiar form, it will penetrate progressively deeper into the wound, and communicate more of its poison, according to the time it is suffered to remain. It should be carefully pulled out with a steady hand; for if any part of it breaks in, remedies will in a great measure be ineffectual. When the sting is completely extracted, the wounded part should be sucked; and little, if any, inflammation will ensue If a few drops of spirits of hartshorn be immediately rubbed on the part affected, the cure will be more speedily accomplished. This spirit, however, acts only as a stimulating anti-spasmodic, enabling the vessels to overcome the spasm formed on the extremities. An application of Goulard-water, or a cold saturnine poultice, would produce a similar effect.

Another simple remedy, equally efficacious and expeditious, is a solution of indigo in water; speedily applied to the injured part.

Honey and olive oil may also be occasionally substituted with advantage; their application should be repeated till the pain ceases.

For treating the stings of these insects, common salt is a more certain and almost instantaneous cure; if the sting be internal the salt must be swallowed: in the contrary case the skin should be previously moistened, in order that it may more easily absorb the saline matter. [Chalk is the best application —T. C.]

The following method of bleaching bees-wax, was laid before the managers of the Pennsylvania Society for the encouragement of manufactures and the useful arts, [but it is the usual and long known process —T. C.]

"It is impossible to change the colour of a wax cake into the utmost degree of whiteness, without increasing the surface of it, so as to submit the inside, as well as the outside, of the wax, to the action of the air.

"This is effected by dividing the wax into an infinite number of thin ribands, which is performed with ease, by the following method.

"The yellow wax, melted in a copper, is received, and kept in fusion in a wooden tub, raised five or six feet

from the ground, and wrapped up in a number of thick blankets of wool. The liquor, or melted wax, is run out of it through a pipe, fixed so high, that the sediments or dregs may be left at the bottom, and is received in a fine bored cullender, or strainer, which lets all run through but the dross or scum. From the cullender the wax runs into a long narrow trough, about five or six feet in length, bored at the bottom with about fifty small holes, ranged in one line, and separated by equal spaces. The wax distributed in its fall by the holes into fifty threads, falls upon a cylinder of some hard wood, which is about five feet in diameter, and as long as the trough, and is fixed parallel, and directly under it. About one half of the thickness of this cylinder is sunk in the water of a long tub, like a bathing-tub, whose width is equal to the length of the cylinder, and on which it is to be turned by a winch. It is plain, that each thread of melted wax must coagulate and grow flat, as it comes upon the cylinder thus dipped in cold water. As the cylinder is kept turning, a thin riband must necessarily be formed of all the streams of wax successively flattened and cooled, which will go off the cylinder by the action of the water, as it comes into it; thus the surface of the water is presently covered with these fifty yellow ribands, which are formed upon, and incessantly spun off the cylinder, as it goes round. They are taken away with a sort of wooden fork with three prongs: and carried to the field to be spread upon long wooden frames, raised two feet from the ground and covered with oil cloth, where the whole, scattered very thin, receives freely the impression of the air and dew.

"This first operation brings it to the half yellow colour. From the bleach yard it is carried back to the second copper, whence it passes into the second tub, and from thence to a cylinder, and corresponding tub as befor , after which it goes to the yard to be bleached anew: this second operation being perfectly like the foregoing. Lastly, they melt it in the third copper, from whence it passes into a tub, and thence into the wax pot, from which they next pour it with a copper ladle into round moles not very deep, where it coagulates into small cakes: these last grow hard in the water of a tub into which they are thrown for that purpose, and then assume the highest degree of whiteness by a final bleaching.

"In a small work one set of vessels will answer very well

"It appears that a more considerable quantity of yellow or unbleached bees-wax was exported in 1790 than in 1801. It has been constantly decreasing, although our population has so much increased, and our cultivation of buckwheat and clover (on both of which the bees feed) is greatly extended. This decrease of the exportation of bees wax, considered relatively to our numbers, proves the increase of the domestic use of wax. All those uses, the rubbing of furniture excepted, are of the nature of manufactures. "The raising of bees in the broken and mountainous part of Greece has always been found very profitable, and merits the attention of our country. It is hoped, however, that after the industrious bees have produced abundance of yellow wax for us, we shall not be such drones as to neglect the easy and beautiful manufacture of it into white wax. Bleaching this article may be well added to the list of household manufacturing operations."

BEECH-TREE, or the *Fagus*, L. a plant of which there are four species, viz. 1. The *sylvatica*, or beech tree, which rises sixty or seventy feet high; 2 The *castanea*, or chesnut-tree; 3. The *pumilea*, or dwarf chesnut-tree, (or *chinquapin*;) and 4. The *Americana*, American chesnut-tree, (*ferruginea*, *Aiton*).

It is one of our handsomest forest trees, and is known by its waved and somewhat oval leaves, and its triangular fruit, consisting of three cells, and inclosed by pairs, in a husk which is covered with simple prickles.

There are beech woods in many parts of England, but the trees flourish best in rich, calcareous soils. These woods, it has been observed, are peculiarly dry and pleasant to walk in; and under their shade afford to the botanist many interesting plants, such as the bird's nest (*monotropa*), winter green (*pyrola*), and some rare *orchideæ* Beech-trees bear lopping well, and may be trained so as to form lofty hedges, which are more valuable for shelter, since the leaves, though faded, remain through the winter, and the twisted branches may be formed into a very strong fence

The *wood* is hard and brittle, and, if exposed to the air, is liable soon to decay. It is, however. peculiarly useful to cabinet makers and turners. Carpenter's planes, tool-handles, and mallets are made of it When split into thin layers it is used to make

scabbards for swords. Chairs, bedsteads, and other furniture, are occasionally formed of beech.

In some countries the *leaves* of the beech tree are collected in the autumn, before they have been injured by the frost, and are used instead of feathers for beds; and mattresses formed of them are said to be preferable to those either of straw or chaff.

BEECH-NUT, or, as it is more generally called *Beech-mast*, is the seed or fruit of the beech-tree, and is recommended for feeding and fattening hogs. These animals may be secured from the *gargut*, by moistening some peas or beans with water, sprinkling them with powdered antimony, and repeating this medicine every other day, for a fortnight. The same precaution should be used when hogs are fed upon acorns. In Hertfordshire, where beech-trees grow spontaneously, swine are kept upon the mast only, and turned out about the middle of October, or sometimes sooner. On this food they thrive very fast, and generally afford fine meat. When a hog is intended to be killed for pickling, it should be previously taken home for a month or five weeks, and fed with pollard, barley meal, or pease It has, however, been remarked, that the flesh of swine fed upon beech-mast, is of too soft a nature, and easily boils away.

When these nuts are eaten by the human species, they occasion giddiness and head-ach; but after being well dried and ground, they have been found to make wholesome bread: they have also occasionally been roasted, and used as a substitute for coffee.

BEECH-MAST OIL, is expressed from the mast after it has been shelled and pounded. It is used in many parts of France and Silesia instead of butter; according to some accounts, it is little inferior to oil of olives. After the oily part has been extracted, the remainder of the mast, when dried, is said to be sweeter and more palatable than before, and may be easily converted into flour, of a similar taste and colour to that of wheat.

In order to obtain pure oil, the following circumstances must be attended to: 1. The fruit must be carefully selected, and all musty, rotten or tainted nuts, particularly those of the former year, should be rejected

2. The shell of the nut should be taken off, which is necessary not only for increasing the quantity but also for improving the quality of oil, because the husk communicates a particular flavour.

3. The film which surrounds the kernel, should then be removed, an operation which is essential to the perfection of the oil and the flour; for the film, though small in quantity, has an astringent, disagreeable taste, which is plainly perceptible both in the oil and the flour, where its removal has been neglected It may be separated by putting the kernels into hot water, as is practised in blanching almonds.

4. After the nuts are gathered, they should be preserved for two or three months in a dry place, so thinly spread out as not to allow them to heat, and often turned to keep them sweet; then bruised like apples in a cyder-mill. In this state, the mass should be put into bags of strong thin canvas, and pressed cold. The oil must be extracted by three degrees of pressure; the first moderate, which gives the purest and finest oil; the second harder, which yields it of an inferior quality; and the third as forcibly as the materials will bear, from which an oil of an indifferent quality is obtained After each separate pressure, the bag should be turned, and the mast, after being well shaken, may be preserved for use.

It has been asserted, that the mast, though three times pressed, is more nutritive than in its natural state. It may, therefore, not only be given as a wholesome food to poultry, swine, and oxen, but also be manufactured into hair-powder. (See an interesting extract from a paper in the *Memoirs of the Royal Academy of Sciences in Paris*, on beech-mast oil, in Dr. ANDERSON's Recreations, vol. 2d.)

BEEF, the flesh of black cattle, prepared for food. This process is managed in various ways, accordingly as the meat is intended for keeping a longer or shorter time. The usual method of salting beef, being generally known, we shall refer to the article "BACON," and briefly observe, that much depends 1. On the purity and quantity of the salt used for this purpose; 2. On the size of the pieces, and the nature of the vessels in which they are kept; and 3 On the ingredients which may be employed with a view to assist the operation of the salt.

It is an established fact, that salt proves antiseptic only when used in a considerable quantity; and that a *weak* brine strongly tends to hasten the putrefaction of animal substances; hence the necessity of making a liberal use of

this article. On the other hand, as common sea-salt contains a very considerable proportion of *magnesia*, one of the most absorbent earths for promoting putrefaction, it is attended with great inconvenience to those who are obliged to make use of large quantities of such salt; because it is difficult to separate that ingredient from this concrete.

Hence *rock-salt*, though apparently more impure, is doubtless more advantageous, and proper for the curing of beef; because its crystallisation has been accomplished by nature, probably after the more earthy base, or magnesia, had, in a great measure, spontaneously subsided. We offer this as a mere conjecture; as it is of little importance to the economist, how this combination of salt and putrefactive earth has originally taken place, if we can suggest a method of purifying the former, so as to render it fit for the purpose intended. See SALT. At present, however, we shall treat first of the manner which, by experience, has been found the most effectual for salting preserving, and imparting a fine flavour to beef, mutton, and pork. For this useful information we are indebted to M. SCHEDLL, who has inserted the following recipe in the "*Economical Journal*," for September, 1795, printed at Leipzig: Take four pounds of common salt, one pound and a half of refined sugar, two ounces of salt-petre, and two gallons of pure spring water. Boil the whole over a gentle fire, and carefully scum off the impurities. After this brine has become cold, pour it over the meat, so that every part of it may be completely covered. In this preparation, the meat not only keeps for many months, but the pickle also has the effect of softening the hardest and toughest beef, and rendering it as mellow as the flesh of chicken. But, in warm weather, it will be necessary to express the blood from the meat, and to rub it well with fine salt, before it is immersed in the liquor.—Young pork should not be left longer than three or four days in this brine, during which time it will be sufficiently softened; but hams intended to be dried, may lie in it a fortnight, before they are suspended. At that period, they ought to be rubbed with pollard, and covered with paper bags, in order to prevent them from becoming fly blown. It farther deserves to be remarked that, though this liquor is more expensive at first than the common brine, yet as it may again be used, after boiling it, and adding more water with a proportionate quantity of the other ingredients, its relative utility is obvious. We understand that the late EMPRESS of RUSSIA employed this composition with uniform success, in her household economy.

A very curious experiment was tried, in the year 1736, before the commissioners of the Victualling-Office, relative to the salting of beef. Both jugular veins of a bullock were opened, and the animal bled almost to death; the carcass was then cut open, the intestines were taken out, and while warm, a tube was introduced into one of the large arteries, which was injected with a strong brine: this circulated through all the blood-vessels, so that the flesh of the bullock was (apparently) salted alike throughout the whole body, for, on cutting a piece of the leg and hip, the brine issued from these parts. Some of this beef was then stowed, and sent to sea with a view to ascertain how long it would keep in that state: but the result of the experiment has not been published.

The superiority of the recipe commonly known by the name of Admiral POCOCK's, is so well known to those who have had an opportunity of comparing it with others, that it ought to be generally adopted. It is thus made. Water four gallons, Muscovado sugar or molasses, a pound and a half, of salt, (the bay or large sort) six pounds. Boil all together in an iron pot, or kettle, and skim it repeatedly, as long as any scum rises; then take off the pot to stand till the liquor is cold. The meat being placed in the vessel meant to hold it, pour the cold pickle on the meat, till it is covered; and, in that state, keep it for family use. If the meat is to be preserved a considerable time, the pickle must be boiled once in two months; skimming off all that rises, and throwing in, during the boiling, two ounces of sugar, and about half a pound of common salt.—Mr. BORDLEY says the above pickle "is incomparable, also, for curing hams, tongues, and hung-beef. When tongues and hung-beef are taken out of the pickle, clean and dry the pieces; then put them in paper bags, and hang them up, in a dry warm place. In very hot weather, it is necessary, before the meat is put to the pickle, to rub it well over with salt, and let it lie for one, two, or three hours, till the bloody juices run off. If the meat in this case be in the least tainted, before it is put to the pickle, it

will be entirely spoiled in a day's time in hot weather.

Mr. Bordley recommends, to keep beeves intended to be killed, two days from food and drink; and, in a dark and close place—He thinks the animal bleeds better, handles lighter and cleaner; and, that the meat looks better by observing these directions. The barrels are to be ready, sweet and well trimmed, and the salt previously washed or refined, and ground small, before the beeves are to be slaughtered. Delay in salting is injurious. The pieces are, therefore, to be packed into the tight barrels, piece by piece, as they are salted; instead of bulking them on a frame or dresser to drain, as is the practice.—Coarse salt, washed but not ground, having also been previously ready, is to be dissolved in fair cold water, until no more can be dissolved on stirring. Let it settle a day or two, skim off the top, pour off all but the dregs. When perfectly cool and clean, it is ready to be poured on the repacked beef.—After the meat has remained in the barrels six or eight days, headed up tight, it is to be taken out, resalted, and closely repacked in the same barrels; the drainings are to be preserved and boiled: the barrels are then to be headed up. In a few days, bore a hole in one of the heads, or the bulge of each barrel, and fill the barrels with the prepared and boiled juices of the meat, saved from [illegible] salting and barrelling. Every time of filling, the barrel being rolled, leaves room for more liquor.—When there is no more of the prepared liquor, the barrels are next to be repeatedly filled with the plain strong brine made as above, from the washed coarse salt, till they can take no more, after standing a short time. Here, as in preserving fish in barrels, the operations are distinctly to *salt*, and to *cure*, (See Art. Herring) and the boiled juices from the salted meat, must serve to beef what the pickle of fish cured, is to herrings. On boiling the blood and juices with the pickle, the firmer parts settle in a mass on standing, and the liquor pours off clean.

The barrels ought not to be exposed either to the sun, or to damp. A cool dry place is best.

Attention to the kind of salt used in salting meats, is of more consequence than is generally imagined. The Hollanders, who furnish the world with the finest flavoured herrings, (caught on the coast of Scotland,) and derive an immense revenue from the trade, prevent by law the use of all kinds of salt in the herring business, except that from Portugal or Spain. It would be well to attend to this circumstance in this country.

[I have made experiments enough on salting meat, to entitle me to form an opinion.

Admiral Pococke's recipe is defective in containing no salt-petre.

If meat be intended merely for family use, and to be used in two or three months, the following pickle deserves to be recommended. Water, one gallon, salt, nineteen ounces, salt-petre, one ounce and a half, sugar, half a pound.

The Russians are fond of the flavour of juniper berries, and add a pound of bruised juniper to a gallon of pickle.

A tea spoonful or two of Cayenne pepper to the gallon, greatly increases the preserving power of the pickle.

To cure gammons, first sprinkle them as soon as they are cut and trimmed, with a little (Liverpool) salt. Let them lay together for twelve hours. take them out of the tub, drain, and wipe them: then rub them separately with a mixture of twelve parts common salt and one part salt-petre, well dried, and then ground fine. Rub in this mixture well: lay them in the pickling tub, and next day rub them [illegible] with a similar mixture. The day after fill up the tub with a brine made in the proportion of 18 oz. salt, 1 lb. molasses, and 1 oz salt-petre, to the gallon of water. In this pickle they may stay for a fortnight. Then take them out, drain, wipe, and smoke them.

If they are suffered to make their own brine by means of dry salt and salt-petre entirely, they will lose too much of the juices of the meat, and become hard and dry.

I have successfully cured beef in summer thus:

I killed an ox in the middle of August, at 9 o'clock in the evening: it was cut up at 3 o'clock in the morning. The pieces were quickly rubbed with a mixture of ten parts of salt and one part of salt-petre, and put into a barrel. In the mean time a brine composed of 1½ lb. of salt, 2 oz. of salt-petre, and half an ounce of common pepper, to the gallon of water, was ready over the fire, and when the beef was all packed in the barrel, it was poured on boiling hot. This prevented, and destroyed all fly-blows. In a week,

the pieces were taken out, drained and wiped; the pickle was boiled over again, scummed, and again poured boiling hot on the meat when repacked. The process answered the purpose perfectly.—T. C.]

As to the properties of beef, in general, we shall only say, that it affords a good, strong, and invigorating nutriment, because no animal food is equal to the flesh of a healthy, middle-aged bullock. Plethoric persons, however, as well as youth, in whom there is naturally a disposition to generate heat, should eat beef in great moderation. Hence, it is most serviceable to the robust and active adult, employed in manual labour, who digests both fat and lean with equal facility. Yet, when salted, even the most tender beef is deprived of a great portion of animal jelly, so that we may without hesitation pronounce, that one pound of fresh beef is equal to one pound and a half in a salted or pickled state.

BEEF-TEA, a preparation commonly made for persons whose energy of the stomach is reduced, either after recovery from diseases, or in consequence of complaints arising from indigestion. It has been a common practice, to treat valetudinarians, or patients with viper-broth, instead of beef-tea; the former, however, does not appear to possess any superior efficacy, though it certainly is more nauseous than the latter.

Beef-tea is usually made by cutting one pound of the lean part of a buttock of beef into very thin slices or shreds, and boiling it with nearly a quart of water: when it grows hot, the rising scum must be taken off, while it continues boiling for about twenty minutes. After it grows cold, this liquor is strained and decanted; in which state it resembles a light infusion of fine green tea: has a very grateful flavour, and is more strengthening than other broths. This recipe is similar to that given by the late Dr BARRY, in his classical "*Treatise on the three different Digestions and Discharges of the Human Body.*" But, on considering the effect of heat on the volatile and spirituous parts of the animal fibre, when immersed in a fluid medium, we venture to suggest a more economical method of preparing beef-tea. Instead of boiling the meat we would advise to reduce it to a pulp (provided it be perfectly clean and fresh) with a wooden pestle, in an iron or marble mortar, and then to express all its juice. After straining this liquor, a little spice may be added, and an equal or larger proportion of boiling water. Thus, the whole essence of the meat will be preserved, part of which would be volatilised by cooking. Nor does it admit of a doubt, that such a liquor possesses greater bracing powers, than if prepared after the usual manner; and that half a pound of beef in this way, is nearly equal to one pound used according to the former method.

It is, however, a doubt whether beef-tea, or any other broth, is more easily digested than solid food: on the contrary, all liquid nutriment of this nature, is better for a moderate portion of bread, rice, barley, or other vegetable aliment. Hence, we are induced to deprecate the custom of inundating, as it were, patients, after their recovery from chronic diseases, with soups, broths, and spoon meat of every description.

BEER, is a fermented spirituous liquor, prepared from any farinaceous grain, but generally from barley, and strictly speaking, is a vinous production, serving as a substitute for wine.

As we propose to give a short analysis of the art of BREWING, under that head we shall here only observe, that all kinds of beer are produced by extracting a proportionate quantity of malt, whether made of wheat, barley or oats in boiling water; then suffering it to remain at rest, in a degree of warmth requisite for inducing a vinous fermentation, and afterwards managing it in the manner as will be described under the article just mentioned. See also FERMENTATION and MALT.

Although malt alone might doubtless produce a liquor, possessing the spirituous properties of beer, yet such a preparation would speedily turn sour and insipid, unless impregnated with hops, or another aromatic and bitter principle, derived from vegetable substances, which not only render it less liable to undergo the putrefactive stage of fermentation, but also impart to it an agreeable bitterness. Of this nature is the hop in a very eminent degree, the price of which, however, has of late years been so exorbitant, that speculative brewers have substituted a variety of other vegetable ingredients, and especially the wood, bark, and root of *quassia* (which see). Independently of the inferior price of this drug, when compared to the indigenous hop, there can be no reasonable objection to its use; as it is one of the few astringent substances possessing a considerable

share of the bitter principle, without partaking of the narcotic, heating, and intoxicating properties of other plants.

It would be difficult to lay down an accurate criterion of the best and most wholesome beer, as its relative strength and flavour, or the immediate effect it produces on the palate, are generally considered the most essential requisites. But a well-brewed and wholesome beer, whether ale or porter, ought to be of a bright colour, and perfectly transparent, that is, neither too high nor pale; it should have a pleasant and mellow taste, sharp and agreeably bitter, without being acrid or tart; it should leave no particular sensation on the tongue; and if drank in any considerable quantity, it must neither produce speedy intoxication, with its concomitant effects of sleep, nausea, vomiting, headach, languor, want of appetite, &c. nor should it be retained too long in the urinary passages, or be too quickly discharged.

[*Recipe for making Beer of Treacle*— To eight quarts of boiling water, put one pound of treacle or molasses, ¼ oz. of ginger, and two bay leaves. Let the whole boil for ¼ of an hour, then cool and work it with yeast the same as other beer. A little yeast spread on a piece of bread toasted, and put into the liquid before it is quite cold, will soon excite a fermentation, and, when it has ceased working, it may be bottled or barrelled according to the quantity made, for immediate use. If wanted to keep, a very small bit of gentian root, with or without a little orange or lemon peel, may be boiled in the liquid; which will not only render it better for that purpose, but give it a taste more resembling beer brewed with malt and hops. Or, for this purpose, boil in your water half a gallon of shorts, and strain it.—T. C.]

Extemporaneous small beer. To two quarts of common porter, add of molasses a pint, of ginger two drachms, of water just warm, eight quarts; let the whole ferment in a warm place, then rack off.

Another. Lemon peel, one ounce, Cream of Tartar four ounces, hops one ounce, molasses one quart, ginger one drachm (sixty grains), bruised cloves four in number, boiling water four gallons; ferment with yeast.

Beer (*Spruce*) To a four-ounce gallypot of essence of spruce, add three quarts of molasses, two gallons of warm rain water, and half a pint of good yeast. Stir them well together until the liquor bears a froth, then put it into the cask, and fill it with nine gallons of water, shaking it well. Set it aside for two or three days to ferment with the bung close, and place the cask in a cool cellar, and in twenty-four hours it will be fit for use. If intended for bottling let the cask stand undisturbed three days before it be drawn off. For the second brewing, the sediment remaining in the cask may be used instead of yeast. If well-water be used it should be warmed a little.

[*Another*—Take of water 16 gallons, and boil the half of it; put the water thus boiled, while in full heat, to the reserved cold part, which should be previously put into a barrel or other vessel; then add 16 pounds of molasses, with a few table-spoonfuls of the essence of spruce, stirring the whole well together; add half a pint of yeast, and keep it in a temperate situation, with the bung-hole open, for two days, till the fermentation be abated; then close it up, or bottle it off, and it will be fit to drink in a few days afterwards. It is made here with a decoction of the leaves and small branches of the black and white spruce firs, instead of the essence of spruce.

It is a powerful antiscorbutic, and may prove very useful in a long sea voyage.—T. C.]

It ought to be mentioned that very great deceptions are practised, with respect to the essence of spruce brought here for sale from Nova Scotia.

In the sixth volume of the *Museum Rusticum et Commerciale*, a work of considerable merit, we meet with a similar account of making a kind of *Table Beer*, which from its cheapness, and agreeableness, is greatly preferable to that obtained from malt; and which has this farther advantage, that it may be made ready for drinking in three or four days. "Take fifteen gallons of water, and boil one half of it, or as much as can conveniently be managed; put the part of the water thus boiled, while it is yet of its full heat, to the cold part, contained in a barrel or cask; and then add one gallon of molasses, commonly called treacle, stirring them well together; add a little yeast, if the vessel be new; but, if it has been used for the same purpose, the yeast is unnecessary. Keep the bung hole open till the fermentation appear to be abated, and then close it up. The beer will, in a day or two afterwards, be fit to drink.

"It is usual to put tops of the spruce fir into the water which is boiled for making this beer; and it is then called *spruce beer*. But, though this is done at sea, when such tops can be obtained, on account of the scurvy; yet it is not necessary, and may very well be omitted, where they are not to be easily procured. Scurvy-grass, or other herbs or drugs, used in making purl, gill-ale, or any other flavoured malt liquor, may be added at discretion. But a little of the outer rind of an orange-peel, infused in the beer itself, and taken out as soon as it has imparted a sufficient degree of bitterness, will both be found grateful, and assist in keeping the beer from turning sour. A very little gentian-root, boiled in the water, either with a little orange-peel, or without, gives also a very cheap, wholesome, and pleasant bitter to this beer."

The philanthropic editor of the "*Reports of th Society for bettering the Condition, and increasing the Comforts of the Poor,*" T Bernard, Esq very justly observes, (in a note, vol. i. p 194,) "that it would be a very desirable thing, that the poor should be able to supply themselves with beer of their own brewing, without being obliged always to recur to the ale house. I am aware of the disadvantage of brewing in small quantities; but that might be compensated for by great advantages, and by the superior flavour of beer *brewed and drunk at home*. The following recipe is according to the proportions used in the House of Industry, at Shrewsbury: "To half a bushel of malt, add four pounds of treacle, and three quarters of a pound of hops; this will make twenty-five gallons of beer; the cost of which (supposing the value of the grain to be only equal to the expense of fuel,) would be two-pence a gallon, where the materials were purchased to the best advantage; and, when bought at the retail shop, about three-pence. I have tried the recipe, and found the beer very good: it was fit for use in a fortnight; but it is not calculated for keeping, particularly in warm weather."

Various schemes have been proposed, and many also adopted, in breweries, for *fining* or *clarifying* different beers But, as the superior brilliancy and transparency of that liquor, depend in a great measure on the quality of the malt and water; which properly belongs to the article "Brewing," we shall here speak of that process only so far as it relates to the management of beer after it is fermented.

Beer should never be forced more than a week before it is tapped, else it becomes stale Dissolve ½ an oz. of isinglass (fish glue) in as much small beer as will make it of the consistence of thin size; put 1½ pint of this in a barrel and stir it about

To give new beer the hard flavour of old beer, brewers add a small quantity of oil of vitriol.

To ropy beer, add a little salt and roll the cask well

There is considerable damage to be apprehended from the effects of a thunder-storm, by which ale or beer is apt to become turbid and flat, not only at the time when undergoing the critical process of fermentation in the tub, but likewise after it has been barrelled.

In the former case we are not acquainted with a better method than that of placing (on the approach of a tempest) several vessels filled with water contiguous to the fermenting vat: with a communicating conductor to the well and the floor of the cellar.

A remedy for recovering tart, or insipid beer, is the following: add to every pint of such beer, a few drops of salt of tartar or pure pearl or potash dissolved in water.

When beer has acquired a peculiar *taste of the cask*, either from an unclean state of the vessel, or, by long keeping, [illegible] the astringency of the oak it is advisable to [illegible] of wheat tied up in a bag, which generally removes the disagreeable taste.

With respect to the physical properties of malt-liquors, we shall observe, that they are possessed of various degrees of salubrity, according to the proportion and nature of their ingredients, namely, water, malt, and hops, of which they are composed; and likewise, according to the manner in which they have been brewed. If, for instance, a large proportion of water has been used, the beer will be more proper for quenching thirst, than if it were strongly impregnated with the mealy and spirituous particles of the malt. Hence, strong and sweet beer is the most nourishing and beneficial to thin and emaciated persons; stale and bitter ale, the most intoxicating; and weak, half fermented porter, the most flatulent, and least serviceable to nervous, debilitated, hysteric, or asthmatic constitutions. But, as there is no peculiar test, by which we can ascertain with critical accuracy, when the vinous fermentation is *completed*, and

the acetous has *commenced*, every kind of beer must be barrelled, or bottled, before it is *perfectly* fermented, so that the completion of this natural process is effected in the stomach and bowels. Strange as this proposition may appear to some persons, it is so true, that the infinite diversity of flavour and briskness obtained from the same mixture, when drawn off into different vessels, or bottles, cannot fail to strike the most superficial observer.

Beer always contains a portion of fixed air, which being disengaged within the human body, is apt to occasion flatulency and looseness. To the mariner, however, and those who are subject to scorbutic complaints, it is, in general, a wholesome beverage, though we cannot refrain from animadverting upon the prevailing erroneous notion, that ale or porter *promote* digestion: this is refuted by the uniform evidence of experience, whence it clearly appears that, of all liquids whatever, *pure water* is the most beneficial solvent of animal and vegetable substances. Such individuals, therefore, as make use of nourishing, and principally animal food, require *no* beer for its digestion; as the habitual drinking of malt liquors will expose them to all the consequences of plethora, or a full and gross habit. Others, however, who live chiefly on vegetable diet, and whose stomachs are weak or impaired, may be gre[illegible] vig[illegible] of *strong* and [illegible] malt-liquors, a purpose which the common table beer cannot answer. Persons of dry and rigid fibres, and whose bile is duly secreted, ought to drink such beer as is sufficiently strong and nourishing, without being of an intoxicating nature. A thin, weak, and well-fermented beer, is diluent and wholesome; whence it agrees well with the plethoric, and persons disposed to corpulency. On the contrary, thick and nourishing malt-liquors are most serviceable to the debilitated, and especially to wet-nurses; consequently *sweet* beers are chiefly nutritive, and more proper for daily use, on account of their being least exposed to dangerous adulterations; while the *bitter* kinds possess medicinal properties, and should be drank with a little of the alkaline solution in a weak state of digestion, by individuals subject to acidity in the stomach. The narcotic power of malt liquor depends on the hop.

Lastly, every kind of beer is improper for the hysteric, the hypochondriac, and all those who are already of a full habit, or manifest a thick atrabilious blood; but it is of peculiar service to the laborious, the lean, emaciated, and all such constitutions as are not liable to flatulency, or any organic diseases of the breast.

BEESTINGS, or Breastings, in domestic economy, a term used for the first milk drawn from a cow after calving.

This liquid is of a thick consistence, and yellowish colour, whence some persons have imagined that it is impregnated with sulphur. As Nature has peculiarly designed the beestings for the purpose of cleansing the young animal from those viscid impurities which, in the human subject, are denominated the *meconium*, it appears rational, that the calf should partake of this benefit. Nor is this strong and viscid liquor calculated to afford a wholesome food; though farmers, in general, give it to the indigent cottager. And, as it is frequently eaten by children, who are scarcely able to digest it, we are of opinion, that it might be better employed in feeding young calves, or by converting it into cheese.

BEET, or *Beta*, L. a plant of which there are four species, viz.

1 The *maritima*, or sea-beet, which grows spontaneously by the sea side, and in salt marshes in many parts of England.

2 The *hortensis*, or common white beet is cultivated in gardens for its leaves, which are frequently used in soups. The root of this species seldom attains a greater size than that of a man's thumb; the varieties are the white beet, the green beet, and the Swiss, or chard beet: these vary from one to the other, but have never been known to change to the first or third sort

3 The *vulgaris*, or red beet, the roots of which are large, and of a deep red colour It is worthy of remark, that the larger these roots grow, they are more tender; and the deeper their colour, the more they are esteemed. The varieties of this species are the common red beet, the turnip-rooted beet, and the green-leaved red beet.

4 The *cicla*, which grows wild on the banks of the Tagus, in Portugal; it is originally a small, white root, but there is a variety of it, called by the Germans *Runkelrube*, or the *Beta altissima* of Botanists, the culture of which cannot be too strongly recommended. The stalk of the latter grows

to the height of seven or eight feet; and the root weighs from eight to twelve pounds. This variety of the root of scarcity is the true *Mangel-wurzel*, which some years since excited much attention in Britain: though there is reason to suppose that other species of the beet have been frequently mistaken for the *Beta albissima*; the root of which is white, juicy, and streaked with red fibres: it is sown like cabbage, and to prevent injury to the fibres of the root, the young plants must not be pulled, but dug up with a spade; they should then be transplanted on the same day (either in rainy weather or after sun-set) on a rich well-ploughed and manured soil, in rows from sixteen to eighteen inches asunder. Sow very thin, and cover the seed an inch only; it will continue in the ground a month. In transplanting, the roots are not to be shortened, but the leaves cut at the top; then set the plant with a dibber, so that the upper part of the root shall appear half an inch out of the ground. The roots, however, will not arrive at perfection, unless the plants be twice hoed, at least, and stripped of the superfluous leaves every fortnight, or three weeks.

From the first and third species before-mentioned, some German chemists have extracted sugar; but the difficulty and expense attending the process are so considerable, that this vegetable will never be worthy of the particular attention of the gardener for this purpose, though it will always deserve to be cultivated as food for man and cattle.

Dr. Achard has published at Berlin the result of a second trial, made on a large scale, to extract sugar from that vegetable, under the direction of a commission appointed for that purpose by his Prussian majesty. By these results, it appears that 1500 quintals of beet-root gave 5952 pounds of raw sugar, 450 quintals of refuse, and 100 ounces of syrup. Thirty quintals of beet-root, cultivated according to the process of Achard, gave each six pounds three ounces of raw sugar. The refuse may be employed as coffee, or to distil spirit, and is more profitable for feeding cattle than beets themselves. The raw sugar may be refined for every purpose whatever. According to a calculation made by the commission charged to examine this discovery, it will produce to [illegible] an annual saving, or rather an [illegible]ge, of two millions and a half of [illegible]llars. Brandy and arrack are made at Berlin of the beet-root. Both are highly praised.

From *white beet* the French, during the late war, endeavoured to prepare sugar; that article as a British colonial produce having been prohibited in France. For this purpose the roots were boiled as soon as possible after they were taken from the earth. When cold they were sliced, and afterwards the juice was pressed out, and evaporated to the consistence of syrup. The sugar was obtained from this syrup by crystallisation. From 110 pounds weight of the roots, 41½ pounds of juice were obtained, which, on further evaporation, yielded somewhat more than 4¼ pounds of brown sugar; and these, by a subsequent operation, produced 4 pounds of well grained white powder sugar.

The residuum, together with a syrup or molasses which remained, produced, after distillation, 3½ quarts of rectified spirit, somewhat similar to rum.

Mr. Bartley, Secretary to the *Bath Agr. Soc.* England, informed Dr. Mease, that the white beet, or *mangel-wurzel*, is very easily cultivated in a deep mellow soil. He made some trials of this root, from which it resulted that 16 lb. of the root [illegible] produce about 1 lb of concrete sugar, and that the maximum crop of an acre of ground might produce, at least, two tons weight of [illegible], or forty tons of the root, in drills three feet [illegible], with [illegible]een inches distance in the rows. [illegible] obtained roots weighing upwards of sixteen pounds each. It would be worth an experiment to ascertain, in the United States, the value of an acre of this root as a winter food for cattle, and to compare it with other food, as turnips, brewers' grains, shorts, linseed jelly, hay, and cut straw, &c. &c.

The common white, as well as the red beet, should be sown separately in the middle or end of March, upon an open spot of ground. It requires a rich soil (such as is fit for wheat) and a low situation, which may be watered occasionally. The ground should be thoroughly cleared of weeds, and manured at least a year before it is sown. As the manuring is a matter of great importance, it should be repeated before the soil is ploughed, which ought to be performed three times. Immediately after the third ploughing the ground should be carefully harrowed. A rake, with teeth from nine to twelve inches distant, should be drawn across it, so as to mark lines, which must be

crossed by others transversely. If the seed be fresh and sound, one is sufficient, but if doubtful, two may be dibbled about the depth of an inch, at each of the points where these lines cross.

The beds of beets must be ¾ of a yard wide, and the plants six or eight inches a-part. When they come up about a finger's length, and if the ground be moist, divide and transplant them into other beds.

Professor SCHERER, of Vienna, found from experiments, that beet-roots afford an excellent substitute for malt, if they be deprived of the greater part of their juice by pressure, then dried, and treated in the same manner as grain intended to be used for that purpose. The beer thus brewed was found to be perfectly wholesome and palatable; being little inferior to that prepared from malt. Besides, the juice obtained from those excellent roots, may be advantageously converted into sugar.

When the plants have acquired six or eight leaves each, the ground should be thoroughly weeded; care being taken not to deprive them of the surrounding soil. If more than one plant appear on the same spot, the superfluous ones must be removed, and wherever a seed has been unproductive another should be sown. When the ground is quite cleared from weeds, the plants grow rapidly, and all farther [illegible] unnecessary [illegible]

The harvest generally commences about the end of August. The root should be dug up with great care, and the leaves and stalks cut off, to prevent it from growing; but in performing this operation, though it is necessary to cut them close, great care must be taken that the root itself be not injured.

In the year 1755, M. LULIN DE CHATEAUVIEUX, being of opinion that a great part of the expense of dung and labour might be saved, if *pot-herbs* could be cultivated in the same manner as wheat according to the new husbandry, sowed a bed forty feet long and six wide, with beet, and two others with carrots. Where the plants grew too thick, they were thinned, so as to leave a distance of fourteen or fifteen inches between the beets, and seven or eight [illegible]en the carrots: neither of them were watered. On digging up the beet-roots, in October, they were all nearly five or six inches in diameter. He ascribes their luxuriant growth to the method of culture without manure.

According to Mr. ROCQUE, the *white beet* is a most excellent fodder for cows; the best way of feeding them, is to mow the plant, and give it to them fresh during the summer.

The *red beet* is possessed of mild aperient qualities, and affords but a weak nutriment to the human body. Hence it should be eaten for supper, by persons of a costive habit: but, though it be easily digested, its use is sometimes attended with flatulency; for which reason, it would be more wholesome and nourishing, to eat the beet with other more mealy roots, such as potatoes; or with those of an aromatic nature, for instance, parsley, celery, &c.

BEETLE, or *Scarabæus*, L. a well-known insect, of which there are eighty-seven species, of one common formation, having cases to their wings, which are the more necessary, as they mostly live beneath the surface of the earth. Besides their diversity of shape and colour, the difference in the size of the various species is also considerable, some not being larger than the head of a pin, while others, as the elephant beetle, are as big as a closed hand.

The May-bug, or cock-chaffer, is the species most deserving of our notice, on account of the formidable ravages it commits on the territory of the husbandman. In some seasons, it has been found to swarm in such numbers, as to devour every vegetable production; our principal object, therefore, will be to point out the best means for its destruction. It is necessary to observe, that the insect is first generated in the earth, from the eggs deposited by the fly, in its perfect state. About three months afterwards, the insects contained in those eggs break the shell, and crawl forth in the form of a small grub or maggot, which feeds upon the roots of vegetables; and continues in this concealed and destructive state for more than three years, gradually growing to the size of a walnut. It is the thick white maggot with a red head, so frequently found on turning up the earth. At the end of the fourth year, these extraordinary insects emerge from their subterraneous abode; when, in the mild evenings of May, an attentive observer may perceive them rising from the earth in numbers before him.

The willow seems to be their favourite food: on this tree they hang in clusters, and seldom quit it till they have completely devoured its foliage. Rooks

are particularly fond of them, when in their state of grubs; and hence the prejudice of farmers against these birds is ill-founded. In Ireland, the damage done by the beetle was at one time so great, in a particular district, that the inhabitants came to the resolution of setting fire to a wood of 6 m.'extent, in order to prevent their propagation

As these insects cannot support the heat of the mid-day sun, and therefore conceal themselves till evening under the leaves of trees, the most effectual way of destroying them is to beat them off with long poles, and then to collect and burn them. or, according to Dr. T MOLYNEUX, they are very beneficial for fattening poultry. Smoke is extremely offensive to them, consequently, the burning of heath, fern, or other weeds, will prevent their incursions in gardens, or expel them if they have entered The leaves of the young turnip are supposed to be devoured by this fly, which Dr DARWIN conceives may be destroyed by rolling.

That very troublesome insect, the common black beetle, may be extirpated by placing a hedge-hog in the kitchen during the summer nights

A German writer recommends to place a bundle of pea-straw near their holes, as they are fond of creeping into it, and after a short time it should be suddenly taken away and burnt.

Another simple method, which is so well known, that it scarcely deserves to be mentioned, is, to place a vessel with any liquid, with pieces of board in an oblique direction, to facilitate their ascent to the edge of the vessel, over which they will fall into the liquid.

BELL, a well known machine, ranked by musicians among the musical instruments of percussion. The constituent parts of a bell are the body or barrel, the clapper on the inside, and the ear or cannon by which it hangs to a large beam of wood. The matter of which it is usually made is a composition called bell-metal The thickness of a bell's edges is usually $\frac{1}{15}$ of the diameter, and its height 12 times its thickness.

The sound of a bell is generally conjectured to consist in a vibratory motion of its parts, much like that of a musical chord. The stroke of the clapper, must necessarily change the figure of the bell, and of a round make it oval; but the metal having a great degree of elasticity, that part will return back again which the stroke drove farthest off from the centre, and that even some small matter nearer the centre than before; so that the two parts which before were extremes of the longest diameter, do then become those of the shortest; and thus the external surface of the bell undergoes alternate changes of figure, and by that means gives that tremulous motion to the air in which the sound consists. Bell-metal is composed of three parts of copper and one of tin.

Belladonna. See Deadly NIGHTSHADE

BELLES LETTRES, or polite literature, a very comprehensive expression, though not easily defined Our industrious predecessors, the editors of the "*Encyclopædia Britannica*," justly complain that they cannot find either a clear definition, or a succinct explanation, of the words *Belles Lettres*, nor any summary of those sciences which are comprehended under this general and collective denomination With diffidence we venture to assert, that, to us, it does not appear a vague term; and though neither the voluminous French nor English Dictionaries contain an analysis of this expression, our difficulties, in this respect, are by no means insurmountable.

When we consider the influence or effect of polite literature on the moral and intellectual character of man, it may be defined to be that extensive ramification of the *subjective* sciences, which are calculated to improve the heart, and enlarge the mind, in contradistinction to those *objective*, or physical sciences, which principally tend to increase the knowledge of the senses, while they explain the nature of external objects, and are therefore denominated *Natural* and *Experimental Philosophy*, including Natural History in all its branches. Of the latter, we shall treat in their proper places; and confine our analysis, at present, to the Belles Lettres. These useful and elegant acquirements, distinguish the accomplished scholar from the illiterate mechanic, who studies and applies the effects of motion, form, variety, and action, while the former endeavours to account for their causes It would be inconsistent with our plan, to accompany every department of polite literature with a separate definition, which would extend this article beyond its proper limits. Hence we shall content ourselves, with exhibiting merely an outline of the branches of this extensive tree of learning

1. The Arts of Speech, comprehend-

ing Oratory and Poetry; which last is again divided into epic, dramatic, lyric, &c.

2 Ornamental Gardening.

3. Elegant Architecture.

4 Music, vocal and instrumental.

5. The Gymnastic Arts, such as Dancing, Fencing, Riding, &c.

6 The Art of Drawing, which includes Painting, Engraving, Carving on Wood, Basso Relievo, and Mosaic Work.

7. The Art of Printing, the most simple, but the most extensively useful.

We cannot, on this occasion, differ in opinion from the Monthly Reviewer, who, in the 79th volume of that work, when analysing the Transactions of the Royal Society of Edinburgh, makes the following judicious remarks: The French, beside many other similar institutions, have long had their Academy of Sciences, and also that of *Belles Lettres.*

BELL-FLOWER, or *Campanula*, L. a genus of plants comprehending 80 species. The following are the principal:

1 The *rotundifolia*, or Round leaved Bell flower, produces blue or white flowers, in August and September. See WITHERING, 241; and CURTIS, *Lond fasc.* 4 t. 21. Cattle and sheep browse upon these flowers with avidity; and they are likewise useful in dyeing. The milky juice of [illegible] flowers is said to [illegible] a beautiful green colour, by the addition of alum. The juice of the blue flowers alone has been used for painting and writing; and DAMBOURNEY asserts, that with these flowers he dyed wool and cloth of a fine *vigogne* colour, having previously immersed them in a properly diluted solution of bismuth.

2. The *rapunculus*, or Rampion Bell-flower, with straight stalks, two feet high, undulated leaves, lance-shaped, and nearly oval; its small blue or white flowers, which appear on the upper part of the stem, blow in July and August. See WITHERING, 242; and *Engl. Bot.* t. 283. Formerly the rampion was cultivated in gardens, for its roots, which were used in salads; and though much neglected, it is often met with in a wild state, on fallows, and beside causeways.

3. The *latifolia*, or Giant Bell-flower, with oval, lance-shaped leaves, a very simple cylindrical stem, solitary flowers in August, and pendant seed: it grows in thickets and under hedges. See WITH. 243, and *Engl. Bot.* t. 302. The roots of this species are likewise an useful addition to salads.

4 The *rapunculoides*, or Creeping Bell-flower, with heart and lance-shaped leaves, a branchy stalk, pendant flowers, and reflected flower-cups

The roots of this species are likewise esculent, and cattle are fond of its leaves.

5. The *glomerata*, or Clustered-Bell-flower, with angular stems, and sessile flowers terminating in a head It grows on high calcareous lands, and blossoms in July and August. See WITH. 244, and *Engl Bot* t. 90. Although bees eagerly frequent the flowers of this species, yet it should be carefully extirpated from meadows and fields as being a pernicious food for cattle.

Bellis. See DAISY.

BELLOWS, an apparatus so contrived, as alternately to inspire and expel the air. This machine is too well known to require a particular description. It is used in chambers, kitchens, forges, and foundries, as likewise for organs, and other pneumatic instruments, to introduce into them a proper volume of air.

ANACHARSIS, the Scythian, is recorded as the inventor of bellows. Their action bears an affinity to that of the lungs; for what is called blowing in the former, is an illustration of respiring in the latter. Animal life may, on some occasions, be supported by blowing into the lungs with a pair of bellows, especially in accidents of drowning or suffocation.

Hessian Bellows, a contrivance for supplying a mine with fresh air, for the respiration of the miners. This machine has been improved by M. PAPIN, who has changed its cylindrical into a spiral form.

[Mr Dowers, of Philadelphia, proposes to distribute iron pipes along the floor of a blacksmith's shop, in which, by means of a horse power for an hour in a day, a sufficient quantity of air might be condensed to supersede the use of the bellows, and the labour of a boy to blow it. The condensed air might be let out as it was wanted.—T C.]

BELLY ACH, or Colic, is a disease which may arise from various causes, and is generally accompanied with costiveness, though sometimes also with diarrhœa, especially in children Adults frequently become liable to attacks of this malady, in consequence of excess

in eating, or after partaking of incongruous mixtures, or dishes, which may occasion a distension of the bowels.

The symptoms of this complaint, in infants, are sudden cries, contraction of the thighs towards the belly, striking with the feet, distortions of the face, not unlike those in laughing, hastily seizing and relinquishing the maternal breasts, acid eruptions, &c. If the child be costive, it will be necessary to relieve the bowels with castor-oil, till it produces the desired effect. When green feces are discharged, a few drachms of magnesia, with one or two of rhubarb, according to the age of the infant, may be given with advantage. Great benefit will, on such occasions, be derived from a proper application of clysters, composed of milk, oil and sugar, or merely a solution of white soap and water, which last is the cheapest and most efficacious. Cataplasms, or the common poultice, made of bread, milk, and oil, may likewise be applied to the lower part of the belly, and repeated as often as they grow cold, adding every time the necessary portion of new milk, to give them a proper consistence. See COLIC.

BELTS, in astronomy, zones or girdles surrounding the planet Jupiter, brighter than the rest of his body, and terminated by parallel lines. They are observed to be sometimes broader and sometimes narrower, and not always exactly in the same part of the disc. Jupiter's belts were first observed by Huygens. Dark spots have been seen on these belts, and M Cassini observed that one was permanent on the northern side of the most southern belt, by which he first determined the length of Jupiter's days, or the time in which he revolves upon its axis. Some astronomers suppose that these belts are seas which alternately cover and leave bare large tracts of the planet's surface, and that the spots are gulphs in those seas: and it has been alleged that the spots are the shadows of Jupiter's satellites.

BELUGA, *Accipenser huso*, one of the chrondropterigious fishes. It is to the common sturgeon, *Accipenser sturio*, and to the beluga, which is found in thousands in the river Danube, that we are indebted for much of the well-known substance called *isinglass*. The mode of making isinglass was long kept a secret by the Russians, and has only of late years been made public. This article consists of nothing more than certain membranous parts of fishes, deprived of their viscous quality, and properly dried. The sounds, or air-bladders, are those of which it is chiefly made. They are taken out while sweet and fresh, slit open, washed from their slime, divested of a very thin membrane which envelopes them, and then left to stiffen in the air. After this they are formed into rolls, each about the thickness of the finger, and put into the shape in which we see them, by small wooden pegs, and left to dry. The kind called *cake isinglass* is formed of bits and fragments put into a flat metal pan with very little water, heated just enough to make the parts adhere, and subsequently dried in the air

Although by far the greatest quantity of isinglass is obtained from the beluga, as being the largest and most abundant fish in the rivers of Muscovy, yet it has been ascertained that this substance may be made from the air-bladders of every species of fresh water fish The principal consumption of isinglass is by brewers and others for the fineing of fermented liquors; this it appears to do merely by the mechanical effect of its organisation, which forms a kind of strainer, or fine net-work, and carries the gross impurities before it as it subsides. It is sometimes employed in medicine; and also in cookery, for making jellies, and other purposes.

BENEFIT *of clergy*, that is, *benefit of learning; a clerk*, formerly signifying a *literate* man. This was a privilege anciently extended to felons, who were entitled to exemption from death if they could read and write. At present, this privilege produces two descriptions of felony, the higher crimes being declared *death* without *benefit of clergy*; that is, in these cases the privilege is not allowed. Some of the lesser crimes are called *felonies* with *benefit of clergy*, to conviction of which sentence of death is not attached.

BENE SEED, the production of an American plant.

This plant (pronounced *Binne*) is the *Sesamum*, L. and was probably introduced into our Southern States, by the negroes from Africa. "It abounds in many parts of Africa, and SONINI and BROWN, both late travellers in Egypt, say, it is much cultivated there, for the purpose of feeding horses, and for culinary purposes. The negroes in Georgia, boil a handful of the seeds with their allowance of Indian corn.

Probably, no plant yields a larger proportion of oil.

According to a letter of Mr. J Morel, inserted in the first volume of the "*Transactions of the American Philosophical Society;*" this seed yields an oil of an equal and even preferable quality, to Florence oil: one hundred weight of seed will produce ninety pounds of oil; its cultivation therefore deserves to be strongly recommended.

[Through the kindness of Dr. Mease, the former editor of this Journal, I have had a full opportunity this summer (1819) of trying the value of the bene-oil, which I find hardly distinguishable from fine olive-oil; I think it contains more mucilage, which gradually subsides on standing. The bene-oil to the south, and the poppy oil in the middle states, ought to banish entirely the olive oil from our tables, which we buy at a very high price, always adulterated with poppy oil—T C.]

BENT GRASS, or *Agrostis*, a genus of grasses comprehending 41 species.

1. The *Spicaventi*, or Silky Bent-grass: it grows to the height of three or four feet, on dry sandy fields See With 126. When young, it affords a tolerable fodder for cattle; but should not be given to them in its mature state, as its sharp leaves are apt to injure their gums. With a decoction of the brown flowers and stalks of this species, linen may be dyed of a pleasing yellow colour, merely by repeated dippings, without any farther addition, except a little alum, which gives it a greenish shade. The stalks are used by the Russians and Tartars, for manufacturing beautiful basket-work.

2. The *Stolonifera*, Creeping Bent-grass, or Blue Squitch-grass, grows in moist fields and meadows; See With. 131.

It deserves to be cultivated, as it produces a wholesome and nourishing fodder for cattle; and, at the same time, suppresses the growth of mosses, and other weeds, by its quick and luxuriant vegetation.

BENZOINE, a concrete resinous juice, obtained, by incision, from the *Styrax benzoe*, L a tree which grows chiefly in the island of Sumatra. This substance is classed, by modern chemists, amongst the balsams. There are two kinds of *benzoine:* benzoe amygdaloides, which is formed of white tears resembling almonds, united together, by a brown matter; and common *benzoine*, which is brown and without tears. The *benzoine* of the shops is usually in very large brittle masses. Easily soluble in alcohol. When chewed, it imparts very little taste, except that it impresses on the palate a slight sweetness; its smell, especially when rubbed or heated, is extremely fragrant and agreeable It is imported from the East Indies, in large masses composed of white and light brown pieces, or yellowish drops, which easily break between the fingers

When exposed, in proper vessels, to the action of fire, benzoine yields a considerable proportion of a white saline concrete, called:

Flowers of Benzoine or Benzoic acid: this chemical production is obtained in a cheap and easy way, invented by Mr. Scheele; his process is as follows: Take one drachm of the salt of benzoine, and dissolve it gradually in 3 ounces of boiling water; then strain the liquor, while hot, into a glass vessel which has previously been heated; let it stand till the crystals are formed, and afterwards carefully decant the solution, and separate all the salt by repeated gentle evaporations and crystallisations. As, on account of their extreme lightness, flowers of benzoine cannot be easily reduced to powder, it is advisable to preserve them in the form of a fine precipitate. When properly made, they have an agreeable taste and a fragrant smell. Spirit of wine dissolves them completely, as well as water by the assistance of heat. In order to keep them suspended in the latter medium, sugar must be added, and, in that state, they may be easily formed into a balsamic syrup. In diseases of the breast, from twenty to thirty grains were formerly administered, and held in great estimation as a pectoral and sudorific medicine; but they are at present seldom employed, except as an ingredient in the well-known paregoric elixir, and, likewise, in the camphorated tincture of opium.

As a perfume and cosmetic, the solution of flowers of benzoine still maintain their reputation at the *toilette;* though, we believe, that their efficacy is not superior to the crystals of lemon juice, or even the salt obtained from the ashes of bean straw, and that their agreeable odour is the only superiority which they possess.

Animal Benzoine, or the Salt of similar properties to that obtained from the *Styrax benzoe* L. has lately been discovered by the French chemists, in the

urine of different animals, especially horses, from which it may be precipitated in a white powder, by adding only a small portion of muriatic acid, or spirit of salt. But this *benzoic acid* has been found in still greater quantities in the urine of cows and horses, in which hay and straw had been soaked. Hence, near cow-houses and stables, where great numbers of cattle are fed, it may be easily manufactured in the large way, by combining this valuable acid with lime, and afterwards precipitating it by the marine acid, which will effectually remove the offensive smell.

Probably the urine of all herbaceous animals contains the benzoic acid in abundance; as it appears to be chiefly derived from the sweet scented spring grass, or *Anthoxanthum odoratum*, L. This fragrant substance has likewise been discovered in the urine of infants, by M. SCHEELE: he, however, observes, that he could precipitate it in considerable quantities, only during that stage of infancy, when there existed no phosphoric acid, or similar salt in the urine; or, in other words, while the phosphoric ingredients were employed by Nature in the formation of bones. This remarkable phenomenon also proves, that the benzoic acid is actually *generated* in the animal economy; because the first nourishment of infants, the mother's milk, does not appear to contain it. Hence, the French chemists have endeavoured to explain the cause of the rapid formation of bones during early infancy; because the phosphoric acid of the urine of infants, and the phosphat of lime contained in milk, both being deposited in a solid form, contributed to the consolidation of the animal frame: and these two substances have, by chemical analysis, been found to serve as the basis of bones. [The benzoat of ammonia is an excellent test of iron in mineral waters.—T. C.]

BERBERRIES, or Barberries, the *Berberis*, L. a shrub better known by the name of *Piperidge bush*. There are three species of this plant, but one only is indigenous, namely, the *vulgaris*, or Common Berberry, which grows spontaneously in hedges, and is frequently cultivated in gardens for its fruit, which makes a good pickle, and is used for garnishing dishes. It rises to the height [illegible] or 10 feet, with many stalks, which [illegible] externally a white bark, but [illegible] on the inside: the stalks and [illegible]ches are thorny; the leaves are o[illegible] and obtuse, with slightly serrated edges; the blossoms grow at the wings of the leaves, in small bunches, like those of the currant-bush: these are succeeded by oval fruit, which are at first green, but when ripe turn to a fine red colour. The flowers appear in May and June; and the fruit ripens in September. See WITH. 350, and *Engl. Bot.* 42.

The berries are so very acid that the birds seldom touch them: they are used in England as pickles and preserves. Insects of various kinds are remarkably fond of the flowers of the barberry. The bees, in searching for honey, touch the filaments, and the anthers approximate to the stigma, and explode the pollen. Dr SMITH, the great English LINNÆUS, has given the following account of this curious phenomenon. "The stamens of such flowers as are open, bend back to each petal, and shelter themselves under their concave tips. No shaking of the branch has any effect on them; but if the inside of the filaments be touched with a small stick, they instantly spring from the petal and strike the anther against the stigma. The outside of the filament has no irritability, nor has the anther itself any, as may be easily proved by touching either of them with a blunt needle, bristle, &c. If the stamen be bent to the stigma, and by means of a pair of scissars applied to the anther, no contraction of the filament is produced. Hence the spring of the stamens is owing to a high degree of irritability in the side of the filament next the germ, by which, when touched, it contracts, that side becomes shorter than the other, and consequently the filament is bent towards the germ. This irritability is perceptible in all ages of the flower. If the germ be cut off, the filaments will still contract, and nothing being in their way, will bend over quite to the opposite side of the flower. After irritation the stamens will return to their original place. The purpose of this contrivance is evident. In the original position of the stamens the anthers are sheltered from rain by the concavity of the petals. Thus they probably remain, till some insect coming to extract the honey from the base of the flowers, thrusts itself between the filaments, and almost unavoidably touches them in the most irritable part: thus the impregnation of the germ is performed, and as it is chiefly in fine bright sunny weather that insects are on the wing, the pollen is also in such weather most fit for the purpose of impregnation.

There are three varieties of this shrub, viz. the berberry, which bears a fruit without stones; the berberry with white fruit; and the eastern berberry, or that which produces a black and sweet fruit.

The first sort is generally propagated by suckers, but the method of planting by layers is preferable. The best time for laying down the branches, is in autumn; and the young shoots of the same year are most proper for this purpose. When this shrub is cultivated for its fruit, it should be planted singly, and not in hedges, as was formerly the practice; the suckers should be cut up every autumn, and the luxuriant shoots pruned; by this means the fruit will be more abundant, and of a better quality than that which grows wild. The third species should be planted in pots, and sheltered as soon as the young shoots are taken off, till the plants have acquired strength, when they may be removed to a warmer situation.

Berberries, on account of their astringent properties, have occasionally been prescribed in bilious diarrhœas. The Egyptians used them in fluxes and malignant fevers, for abating heat, invigorating the body, and preventing putrefaction. For this purpose, the fruit, according to Dr. LEWIS, should be macerated for twenty-four hours, in twelve times its weight of water, with the addition of a little fennel-seed; the liquor, when strained, should be sweetened with sugar, or syrup of lemons, and given liberally as a drink. The flowers, when near, are offensive to the smell, but at a distance their odour is extremely fragrant. An infusion of the bark in white wine, is purgative. In distillation, the berries, when previously bruised, have been mixed with the grain to increase the quantity of spirituous liquors. The roots, boiled in ley, impart a yellow colour to wool; and in Poland, leather is tanned of a beautiful yellow with the bark of the root. The inner bark, also, with the addition of alum, has been employed for dyeing linen of a similar colour [It is much used in Philadelphia by the Morocco dyers—T. C.]

The effect of this shrub upon wheat fields, is truly singular; and though well known to botanists, is not familiar to every farmer. When growing in the hedges near corn fields, it changes the ears to a dark brown colour, and prevents them from filling; nay, its influence in this respect has often extended across a field to the distance of three or four hundred yards: it should, therefore, be carefully eradicated from lands appropriated to tillage It is eaten by cows, sheep, and goats, but rejected by swine.

BERE, or *Barley-big*, or *Square Barley*, is a very strong luxuriant plant, both in grain and straw: it resembles barley in growth, and cone-wheat in size It is generally cultivated in Ireland, for malt, in the best and richest soil, usually after potatoes: the time of sowing is between Michaelmas [28 Sept] and Christmas, at the rate of one barrel, which is two hundred weight, to an Irish acre; and its produce is said to be, generally, from twenty to thirty-five barrels an acre. Two bushels and a half of seed to an English acre, will be in the same proportion. For the information of those readers who are not acquainted with the difference in the measurement of land, we shall observe, that five Irish are equal to eight English acres and fifteen perches, or 70,560 feet to an Irish, and 43,560 feet to an English acre.

The culture of bere is recommended in this country—1. Because it will succeed extremely well in any soil fit to produce a crop of barley, and even on cold stiff lands, where barley will not thrive: 2 As it ripens from one to three weeks sooner than any other grain: 3. It may, if generally cultivated, be introduced into our malt-distilleries, not only instead of barley, but, what is of much greater importance, as a substitute for wheat, of which so much is used in these manufactures: and, lastly, it may, with great advantage, be given to swine, instead of barley-meal—Moreover, it has been asserted, that an acre of land will yield more of this grain than of barley.

Bere labours under the disadvantage of not being easily cleared of its auns, or beard. This has been imputed to carelessness in cleansing, or preserving it from moisture in the stacks; but the difficulty is more probably owing to the grain being cut down before it is thoroughly ripe.—If sown earlier than usual, it is still more productive.

A correspondent, in a letter to the editors of the "*Museum Rusticum*," &c. mentions a curious circumstance respecting the cultivation of this grain: "Amongst some wheat," says he, "that was sown last year, a small quantity of bere happened to be mixed; all of which bere is now in the ear, and in the most

flourishing condition I ever beheld: even the long-continued easterly wind has not in the least affected it; and we may expect it to be ripe very soon. I could earnestly desire some of your readers to try the experiment, and shall endeavour to have it done myself. There are many of your readers who would be glad that this grain had a better character as to its cleanliness; and I am persuaded it would come into great esteem every where."

BERGAMOT, a variety of the citron, produced by grafting the latter on the stock of a bergamot pear tree. The fruit has an exquisite smell and flavour; and its essence is highly esteemed as a perfume, by cutting the rind into small pieces, and expressing the oil into a glass vessel. A fragrant water is distilled from the peel, as follows: Take the rind of three bergamot-pears, one gallon of pure spirit, and four pints of water; draw off a gallon in a *balneum maris*, or water-bath, and add a sufficient quantity of refined white sugar; or, take of the essence of bergamot, three drachms and a half, spirit of wine three pints, and of volatile sal ammoniac one drachm; distil off three pints in a similar manner.

BERNE MACHINE, an engine for rooting up trees, invented by P. SOMMER, a native of Berne in Switzerland.

This machine consists of three principal parts: the beam, the ram, and the lever. The beam is composed of two planks of oak, three inches thick, and separated by two transverse pieces of the same wood, of an equal thickness. These planks are perforated with holes to receive iron pins, upon which the lever acts between the two sides of the beam, and is shifted higher as the tree is raised out of its place. The sides are secured at the top and bottom by strong iron hoops The pins should be an inch and a quarter, and the holes through which they pass, an inch and a half in diameter. When the machine is in action, the bottom of the beam is secured by stakes driven into the earth. The ram, which is made of oak, elm, or some other strong wood, is capped with three strong iron spikes, which take fast hold of the tree. This ram is 6 to 8 inches square; and an incision is made longitudinally through its middle, from the lower end to the first ferule, in order to allow room for the chain to play round the pully, which should be four inches thick, and nine in diameter. The ram is raised by means of the chain, which should be about 10 feet long, with links four inches and three quarters in length, and one inch thick. One end of this chain is fastened to the top of the beam, while the other, after having passed through the lower part of the ram, and over the pully, terminates in a ring or link, the two ears of which serve to keep it in a true position between the two planks of the beam. The hook, which should be made of very tough iron, is inserted in this ring; and the handle ought to be two inches thick where it joins to the hook, and gradually lessen in thickness up to the arch, which should be about half an inch in diameter. On each side of the upper pin is a semi-circular notch, which rests alternately on the pins, when the machine is worked. The hole and arch serve to fix a long lever of wood, by means of two iron pins, and thus it is raised or lowered at pleasure, in order to render the working of the machine easy, in whatever part of the beam it may be placed; for, without this contrivance, the extremity of the lever would, when the handle is near the top of the beam, be higher than men standing upon the ground could reach

This machine is worked in the following manner: it is placed against a tree, and the end of the beam supported by stakes. The iron handle is placed in the opening between the two planks of the beam, and the wooden lever fixed to it, by means of the iron pins. The hook takes hold of the chain, and one of the iron pins is thrust into the outer row of holes, by which means the exterior notch will rest on the pin, which will be the centre of motion; and the end of the lever being pressed downwards, the other notch will be raised, at the same time the chain, and consequently the ram. Afterwards, the other iron pin is to be put into the hole in the inner row, above that which was before the centre of motion, and the end of the lever elevated or pushed upwards, the latter pin on which the notch rests then becoming the centre of motion. By this alternate motion of the lever, and shifting the pins, the chain is drawn upwards over the pulley, and consequently the whole force of the engine exerted against the tree. There is a small wheel joined to the end of the ram opposite the pulley, in order to lessen the friction of that part of the machine.

From this account, the reader will perceive that the machine is a single pulley, compounded with a lever of the

first and second order. As the push of the engine is given in an oblique direction, it will exert a greater or less force against the horizontal roots of the tree, in proportion to the angle formed by the machine with the plane of the horizon; and the angle of 45° is the maximum, or that when the machine will exert its greatest force against the horizontal roots of the trees [The best machine is an axe.—T. C.]

BERYLL, a mineral, is noticed on account of its properties. It is of a green colour in all its shades. It is crystallised in six sided prisms, which are perfect or truncated on the edges and angles It is nearly as hard as the topaz, and can scarcely be melted without the addition of some other substance. With borax it melts easily. It becomes electrical by rubbing, and is found in primitive rocks, accompanied with quartz, felspar, garnet, mica, fluor-spar and topaz. The most beautiful specimens are brought from China and the Brazils. When pure, they are cut into rings and necklaces.

[BERYLL, or common emerald: a crystallised stone of a light sea-green colour, containing the earth glucine, and found usually crystallised, sometimes opaque, sometimes transparent, in the granite rocks from Maine to Georgia. It is found very large in the granite, near Limoges, in France; it is plentiful in the granite about Philadelphia.—T.C.]

Bethlehem. See STAR of Bethlehem.

BETONY (Wood) or *Betonica Officinalis*, L a low perennial plant, growing wild in woods and thickets; its flowers, which appear in July and August, are of a purplish colour, and stand in spikes on the tops of the stalks See WITH. 530; and CURT *Lond fasc.* 3. t. 33

Tanners have employed this plant as a substitute for oak bark; and, according to DAMBOURNEY, the leaves and branches of the betony, when in blossom, may be used for dyeing wool of a permanent dark brown colour, when previously dressed in a weak solution of bismuth

The leaves and flowers have a bitterish taste, accompanied with a weak aromatic flavour. They are mild corroborants, and when infused, or gently boiled, the decoction may be drank as tea: a strong tincture made in rectified spirit, has proved beneficial in laxity and debility, when taken in small, repeated doses.

It is remarkable, that the roots of this plant greatly differ in quality from the other parts; the former are bitter, nauseous, and, like the roots of hellebore, occasion violent diarrhœa, when taken in a small dose It is farther affirmed, that betony affects those, who gather any quantity of its leaves and flowers, with a disorder resembling the effects of intoxication.

BETULA, the *birch-tree* The trees of this genus most commonly known are the *birch* and the *alder*. All the betula love a moist soil. The birch is applied to an infinity of uses. A wine is drawn, by tapping, from the trunk, by the natives of Canada; and, in Europe, wine is made from the fruit of the alder. The birch, though the worst of timber, is manufactured into vessels of various domestic uses. It makes capital charcoal. The inner silken bark, which peels off annually, was formerly used for writing on, before the invention of paper In the northern climates the coarse bark is used instead of tiles or slates for the covering of houses. It is also used in certain processes of dyeing, and for tanning leather In Kamtschatka, they form the bark into hats and drinking cups One great advantage in the birch, is, that it will grow where scarcely any thing else will thrive, and thus, almost barren land may be made to bring in a certain income of at least 20*s*. per acre. Broom makers are constant customers for the twigs, and hoop benders for the larger branches, and for the trunks, the turners and manufacturers of instruments of husbandry have a constant demand.

BEVEL, among masons, carpenters, &c. a kind of square, one leg whereof is frequently crooked, according to the sweep of an arch or vault. *Bevel-angle*, any other angle than those of 90 and 45 degrees.

BEZOAR, in natural history and medicine, is a calculous concretion, found in the stomach of animals of the goat kind. It is a morbid substance, possessing neither taste nor smell, and it cannot be considered in any other light than as a weak absorbent. In a more comprehensive sense, bezoar includes all concrete substances formed in the intestines of animals; hence pearls, and the concretions called crab's eyes, belong to the class of bezoars.

Fossil Bezoar, is a kind of stone formed like the animal bezoar of several coats round some extraneous body. It is found in Sicily, in sand and clay pits.

BIBLE, a name applied by Christians by way of eminence to the collection of sacred writings, or the Holy Scrip-

tures of the Old and New Testaments, known also by various other appellations, as the Sacred Book, Holy Writ, Inspired Writings, &c.

The sacred volume, including the Old and New Testaments, is justly looked upon as the foundation of the Jewish as well as the Christian religion. The Jews, it is true, acknowledged only the Scriptures of the Old Testament, the correcting and publishing of which, is unanimously ascribed, both by the Jews and Christians, to Ezra. Some of the ancient fathers, on no other foundation than that fabulous and apocryphal book, the second book of Esdras, pretend, that the Scriptures were entirely lost and destroyed at the Babylonish captivity, and that Ezra restored them all again by divine revelation. What is certain, is, that in the reign of Josiah there was no other book of the law extant, besides the copy found in the temple by Hilkiah; from which original, by order of that pious king, copies were immediately written out, and search made for all the other parts of the scriptures, (2 Kings, XXII) by which means copies of the whole became multiplied among the people, who carried them with them into their captivity. After the return of the Jews from the Babylonish captivity, Ezra got together as many copies as he could of the sacred writings, and out of them all prepared a correct edition, disposing the several books in their proper order, and settling the canon of scripture for his time. These books he divided into three parts, viz. 1. The Law. 2. The Prophets. 3. The Cetubim or Hagiographia, that is to say, The Holy Writings.

I. The Law contains—1. Genesis. 2. Exodus. 3 Leviticus. 4. Numbers. 5. Deuteronomy. II. The writings of the Prophets are, 1. Joshua. 2. Judges, with Ruth. 3 Samuel. 4 Kings. 5. Isaiah. 6. Jeremiah, with his Lamentations. 7. Ezekiel 8 Daniel. 9 The twelve minor prophets 10. Job. 11. Ezra. 12. Nehemiah. 13 Esther. III. The Hagiographia consists of, 1. The Psalms. 2. The Proverbs. 3. Ecclesiastes. 4. The Song of Solomon. This division was made for the sake of reducing the number of the sacred books to the number of the letters in their alphabet, which amount to 22. At present the Jews reckon 24 books in their canon of scripture, in disposing of which the Law stands as it did in the former division, and the Prophets are distributed into the former and latter Prophets.

The former Prophets are, Joshua, Judges, Samuel, Kings. The latter Prophets are, Isaiah, Jeremiah, Ezekiel, and the twelve minor Prophets. And the Hagiographia consists of the Psalms, the Proverbs, Job, the Song of Solomon, Ruth, the Lamentations, Ecclesiastes, Esther, Daniel, Ezra, the Chronicles.—Under the name of Ezra they comprehend Nehemiah.

The division of the Scriptures into chapters, as we at present have them, is of much later date. Some attribute it to Stephen Langton, archbishop of Canterbury, in the reigns of John and Henry III. But the true author of the scheme was Hugo de Sancto Caro, commonly called Hugo Cardinalis, because he was the first Dominican that ever was raised to the degree of cardinal. This Hugo flourished about the year 1240. He wrote a comment on the Scriptures, and projected the first concordance, which is that of the vulgar Latin Bible. The aim of this work being for the more easy finding out any word or passage in the Scriptures, he found it necessary to divide the book into sections, and the sections into subdivisions: for till that time the vulgar Latin Bibles were without any divisions at all. These sections are the chapters into which the Bible has ever since been divided. But the subdivision of the chapters was not then into verses as it is now. Hugo's method of subdividing them was by the letters A, B, C, D, E, F, G, placed in the margin at an equal distance from each other, according to the length of the chapters. The subdivision of the chapters into verses, as they now stand in our Bibles, had its origin from a famous Jewish rabbi, named Mordecai Nathan, about the year 1445. This rabbi, in imitation of Hugo Cardinalis, drew up a concordance to the Hebrew Bible, for the use of the Jews. But though he followed Hugo in his division of the books into chapters, he refined upon his invention as to the subdivision, and contrived that by verses: this being found to be a much more convenient method, it has been ever since followed. And thus, as the Jews borrowed the division of the books of the Holy Scriptures into chapters from the Christians, in like manner the Christians borrowed that of the chapters into verses from the Jews.

BICE, or BISE, a blue colour, prepared from the *lapis armenus*. Bice bears the best body of all the bright blues used in common work, as house-

painting, &c. but it is the palest in colour It works tolerably well; but inclines a little to sandy, and therefore requires good grinding. Next to ultramarine, which is too dear for general use, it lies best near the eye, of all other blues.

Bidens See MARYGOLD.

BIENNIAL PLANTS are those of only two years duration Several vegetables are of this tribe; being raised from seed, they generally attain perfection the first year; and in the following spring, or summer, they produce their flowers and seeds, and soon afterwards decay.

Biennials consist of esculents and flower-plants The former include the cabbage savoy, carrot, parsnip, beet, onion, leek, &c and the latter, the Canterbury bell, French honey-suckle, wall flower, stock July-flower, Sweet-William, China-pink, common-pink, carnation, scabious, holly-hock, tree-mallow, vervain-mallow, tree primrose, honesty, or moonwort, &c. all of which, if sown in March, April, or May, rise the same year, and in the following, shoot up into stalks, flower, and produce perfect seeds in autumn. Though most of the biennials dwindle in the third year, a few of them, particularly holly-hocks, wall-flowers, carnations, and pinks, produce flowers which, however, are generally small, and of faint colours. Hence it is necessary to raise an annual supply from seed; though the three last mentioned plants may be propagated by slips and layers.

BIGAMY, properly signifies being twice married; but with us is used as synonymous to polygamy, or having a plurality of wives at once. Such second marriage, the former husband or wife being alive, is simply void, and a mere nullity, by the ecclesiastical law of England; and yet the legislature has thought it just to make it felony, by reason of its being so great a violation of the public economy, and decency of a well-ordered state

BIGNONIA CATALPA. A native deciduous tree of the United States, covered with a smooth brown bark; the flowers are produced in large branching pinnacles, towards the ends of the branches; they are of dark white, with a few purple spots, and faint stripes of yellow on their inside. The flowers are succeeded by long taper pods, containing seeds. The branches dye wool a kind of cinnamon colour. THUNBERG mentions that the Japanese lay the leaves on parts of the body affected with pains; and that a decoction of the pods is esteemed serviceable in the asthma. Poultry are very fond of the seeds, and thrive on them. The timber of the catalpa tree, makes very durable fence posts

Bignonia crucigera, or cross vine, is so called from the pith dividing the stem longitudinally into four equal portions, so that when cut through transversely, it exhibits the appearance of a cross. A decoction of this plant is much used in Carolina in cases of yaws, and other obstinate ulcers, by way of diet drink, combined with sassafras root, China-brier root, and polypody.

Bignonia sempervirens, or Carolina yellow jesamine, is a beautiful vine, rising with slender stalks, which twist themselves round the neighbouring plants, and mount to a considerable height. The flowers are trumpet-shaped, and have a very sweet scent. It grows luxuriantly and naturally in most parts of South Carolina, and is a native of some parts of Virginia. When in flower, it perfumes the air to a considerable distance. The flowers are yellow, and smell like the wall flower

BILBERRY, or the *Vaccinium*, L. is a plant of which, according to BECHSTEIN, there are twenty-six species, while others enumerate only fifteen.

1. The *Myrtillus*, or Bilberry, which grows in abundance in woods and heaths. See WITHERING, 370, and *Eng. Bot.* 456 The berries, when ripe, are of a dark blue colour; and, on account of their astringent quality, are occasionally given in diarrhœas, with good effect In Scotland, they are eaten by the Highlanders in milk; and likewise used in tarts and jellies; they produce a violet-coloured dye, which requires to be fixed with alum. The juice mixed with a fourth part of lime, verdigrise, and sal ammoniac, affords a purple pigment used by artists. The young tender leaves of this plant, properly dried, are an excellent substitute for tea.

2. The *uliginosum*, or Great Bilberry, is found on marshy heaths See WITHERING, 370, and *Eng. Bot.* 581. The fruit of this species is not so much esteemed as that of the preceding, because, if eaten in any quantity, it is apt to occasion head-ach.

3 The *Vitis Idæa*, or Red Whortle Berry, which grows on heaths, and in woods See WITHERING, 371, and *Eng. Bot* 593. Its fruit is acid and cooling In Sweden it is eaten in the form of a jelly The young leaves of this spe-

cies might also be advantageously used instead of tea, from which they can scarcely be distinguished

4 The *Oxycoccus*, or Cranberry, is common in bogs covered with mosses. See WITH. 372, and *Eng. Bot* 319.

Great quantities of these berries are used in Confectionery, as delicious ingredients in tarts, to which they impart a rich flavour It deserves to be added, that this fruit may be kept in a fresh state for many years, merely by immersing it in a bottle filled with spring water, and closely stopped. Silver, boiled in a decoction of the berries, acquires a whiter and more beautiful lustre.

All the species of the bilberry are antiseptic; and their juices, mixed with sugar, and properly fermented, may be converted into grateful and wholesome domestic wines.

BILE, is a yellow or greenish saponaceous liquor, secreted in the liver, and collected in the gall-bladder, into which it regurgitates, as it were, into a blind gut, and is thence discharged into the lower end of the *duodenum*, or beginning of the *jejunum*. (See ABDOMEN.) Its principal use appears to be that of sheathing or blunting the acids contained in our daily food, and thus enabling the milky liquor, called chyle, after being mixed with bile in the duodenum, to enter the lacteal veins, or milk vessels, which convey a nutritious supply to the whole body (See LACTEALS.) Hence an increased quantity of aliment requires a greater proportion of bile, to promote its digestion; and, accordingly, as the stomach is more or less distended with food, it presses on the gall-bladder to obtain a proportionate quantity of bile, which is then mixed with the chyle, as before described. See CHYLE, and LIVER.

Bile is a very important fluid in the animal economy, insomuch, that from an excessive secretion of it, the inhabitants of warm climates become liable to many tedious, and often fatal diseases. A superabundance of bile in the first passages, either flows again into the stomach, and is productive of general languor, nausea, a foul tongue, loss of appetite, and indigestion, or, when it is determined to the intestines, it is generally attended with a painful diarrhœa. In the temperate climates, however, a vitiated and superfluous bile is more frequently diffused through the whole body. In this case, the skin assumes a yellow colour, the urine becomes sensibly impregnated with bilious matter, the pulse is preternaturally quick, and the patient complains of heat, thirst, head ach, and other symptoms of fever. His body becomes gradually emaciated, and his visage strongly indicates the disorder of the constitution. Various are the causes of this extensive derangement of the different bodily functions; but we may safely assert, that most persons, particularly in hot climates, contract bilious diarrhœas, colics, fevers, and chronic diseases of the liver, by intemperance in eating animal food, drinking spirituous liquors, and by braving the sudden transitions of temperature, from the intense heat of day to the piercing chillness of night, and thus checking insensible perspiration, one of the most necessary excretions of the human body. For the cure of such maladies as may arise from numerous and diversified causes, no general plan can be safely prescribed But it deserves to be remarked, that the greatest benefit may be derived from adopting a proper diet and regimen, both with a view to prevent and relieve bilious diseases Hence we would advise persons liable to eructations, flatulency, and costiveness, which arises from a vitiated bile, to abstain from all acrid, watery, and oily food, especially butter, and fat meat; to abandon hot liquors, such as tea, coffee, punch, &c; to regulate the depressing passions of grief, anger and anxiety; to exchange a hasty and irascible for a more placid and composed temper; and on the whole to pursue a calm, steady, and temperate course of life.

Vitiated Bile, is a common disease in infants, who are suckled by intemperate or passionate nurses, or, in consequence of their being fed with improper nutriment, such as viscid pap made of flour, instead of biscuit or well baked bread; animal food, before they are twelve months old; gingerbread and pastry This complaint manifests itself by green stools, and an acrid quality of the bile, which even excoriates the flesh; the child expresses its pain by incessant crying, and drawing up of the legs. Nature therefore frequently removes the evil by copious evacuations, which are spontaneously excited by the acrimonious state of the humours Hence the impropriety of administering chalk clysters, combined with laudanum, or other cordials, and thus in a manner locking up the poison within the intestines, while the infant becomes most effectually intoxicated. Thence arise convulsions, enlargement of the mesen-

tery, a principal, though remote, cause of consumption; the scald head; and scrophula in all its forms.

Instead of following those dangerous practices, which are calculated only to aggravate the complaint, two circumstances ought to be attended to, namely. 1. To remove the stimulating matter, by repeated small doses of tamarinds, combined with a solution of manna, and 2 To counteract the preternatural weakness and irritability of the intestinal canal, by the addition of gum arabic, powder of salep-root, or a little jelly made of Iceland moss. In cases, however, where considerable acidity prevails, it will be advisable to give a few grains of magnesia, in intermediate doses: but, if the spasmodic strictures of the abdomen continue, a medical practitioner should be consulted, whether it be proper to have recourse to a few drops of laudanum, or paregoric elixir, remedies which ought never to be intrusted to dabblers in medicine.

[Inspissated and dried ox-gall is used as a substitute for the gall-stone by colour makers. Bile turns green with strong acids: so does gall-stone: hence green stools betoken great acidity, and call for magnesia.—T C]

BILIARY-*Calculi*, or Gall-Stones, are concretions of bile formed in the gall-bladder, or in the duct through which the bile passes into the intestinal canal These concretions are of a very bitter taste, and are generally of a brown colour, so light as to float in water, and inflammable; they occasion the jaundice and other disorders, and are themselves supposed to be formed by the absorption of oxygen by the bile, in its passage.

BILL OF EXCHANGE, is a letter of request, when A owing B a sum of money, B desires A to pay it to C. In common speech, such a bill is frequently called a *draught;* but *bill of exchange* is the more legal, as well as more mercantile, expression The person, however, who writes this letter is called, in law, the *drawer;* and he to whom it is written the *drawee;* and the third person or negotiator to whom it is payable is called the *payee.*

BINARY Arithmetic, that in which two figures or characters, viz 1 and 0, only, are used: the cipher multiplying every thing by 2, as in the common arithmetic by ten: thus, 1 is one, 10 is 2, 11 is 3, 100 is 4, 101 is 5, 110 is 6, 111 is 7, 1000 is 8, 1001 is 9, 1010 is 10: being founded on the same principles as common arithmetic. This sort of arithmetic was invented by Leibnitz, who pretended that it is better adapted than the common arithmetic for discovering certain properties of numbers, and for constructing tables.

BINDWEED, or *Convolvulus*, L. a genus of plants, comprising forty three species.

1. The *arvensis*, or Small Bindweed, a common plant in fields and hedges, but particularly troublesome in gardens of a gravelly soil; its white and red flowers appear in June and July. See WITH 239, and *Engl Bot.* 312. As the roots of this plant, particularly in wet seasons, strike deep into the ground, and injure the growth of corn, they ought to be carefully extricated, and transplanted on the sandy banks of rivers and lakes, where they greatly tend to bind the soil. Bees are uncommonly partial to the flowers of the convolvulus; and it is eagerly eaten by black cattle, and sheep

2 The *sepium*, or Great Bindweed, likewise a pernicious plant in gardens; it thrives under moist hedges; its stalk grows to the height of several feet, and bears white or purplish blossoms in July and August See WITH 240, and *Engl Bot* 313 The root of this species is very acrid and purgative to the human constitution; but does not affect swine, though eaten in large quantities. Its flowers are frequented by bees.

3 The *soldanella*, or Sea Bindweed, grows on the sandy shores of the sea, but cannot be long preserved in gardens; its purple flowers blow in July. See WITH 240, and *Engl Bot* 314. This species is also possessed of cathartic properties, so that half an ounce of the juice of the root, or one drachm of the powder, is a strong dose The leaves of the Sea Bindweed have often been externally applied for the reduction of dropsical swellings of the legs; and, it is asserted, with good effect.

Among the *exotic* species of this plant, we shall only mention the *Convolvulus Jalappa*, or Jalap, a native of Spanish America, which affords the drastic medicine of that name; the *Batatas*, or (sweet potatoes. See POTATOES,) a delicious root, but too delicate to thrive in the open air of England; the *scoparius*, or Bushy Bindweed, which grows wild in the island of Barrancos, and affords, it is said, the fragrant oil and wood of Rhodium, and, lastly, the *Scammonia*, or Syrian Bindweed from the inspissated juice of

which is prepared the efficacious purgative substance known by the name SCAMMONY.

BIRDWEED, Black; See climbing BUCKWHEAT.

BIOGRAPHY, an account of the lives and characters of remarkable persons. It is the most entertaining and instructive branch of history, and admits of the description and passion of romance, with this essential difference, that the characters and incidents ought not only to be agreeable to Nature, but strictly true. Hence no books are so proper for the amusement and instruction of youth, who, by reading them, are incited to the imitation of great and virtuous actions; while they are deterred from vice, by an animated delineation of its baneful effects.

As the subjects of biography are the lives of either public or private persons, many useful observations may be made from authentic accounts of those who have been eminently beneficial to society. Nay, even the lives of immoral characters may serve as a warning to deter others, and especially youth, from listening to the temptations of folly and vice.

Philanthropists, who have exposed their lives, or employed their faculties in the service of their fellow-creatures, deserve that their memory should be perpetuated, both as a tribute of public gratitude, and as virtuous examples in the annals of history. The love of fame is natural to the human mind; and, when properly directed, is at once productive of happiness to the individuals, and general benefit to mankind.

In the lives of great men, their public characters are principally to be regarded; but, as the world is inquisitive, the investigation of their private conduct may also occasionally be useful, to illustrate the influence of example. On the other hand, too minute an inquiry into the foibles and infirmities of eminent men, is an illiberal and censurable curiosity. Among the ancient biographers, PLUTARCH is generally allowed to excel. On the relative merits of the moderns, we shall not venture to pronounce; as this would be an invidious and unpleasing task.

BIRCH-TREE, (Common), or *Betula alba*, L. is one of the indigenous trees which has already been mentioned under the head of "ALDER-TREE," though the latter is only a species of the same genus, and ought more properly to have been denominated *Betula alnus*, L. See BETULA.

The white or common birch-tree, is not of a large growth, but when cultivated in a favourable soil, and a good situation, it rises to a considerable height. There is a degree of elegance in its general appearance in summer, and the bark in winter is frequently variegated with red and white. It is easily cultivated by the usual method, but, when raised from seed, the young shoots of the birch should remain two years in the seminary, and then be transplanted in rows. They may also be propagated by layers: for this purpose, a sufficient number of plants should be placed at a distance of three yards from each other, in a soil which has been twice turned by the spade. If, in the following year, they should produce no shoots, they may be lopped to within half a foot of the ground, to form the stools, in consequence of which they will germinate with vigour in the following summer. In autumn, the young shoots should be plashed near the stools, and the tender twigs, layered near the ends. Thus managed, they will have taken root, and become fine plants, the following autumn.

LEONARDI remarks, in the second volume of his "*Natural History*" p. 629, Germ. edit. that the flower catkins of this tree, when boiled in water, afford a good substitute for SOAP.

Beside the utility of the sap or juice of the birch tree, in affording a delicious *wine*, it appears from the experiments of HERMSTÄDT, that *sugar* may be obtained by inspissating the juice of the variety called Black Birch. Such sugar, however, is not only of an inferior quality, but less in quantity, than that prepared from the Sugar-maple.

The wood of the birch is of very extensive use, as we have before stated under the article ALDER. Prof. PALLAS informs us, that the Tartars cover their huts with its bark, and the navigators of the Volga construct of it portable boats, cradles, &c. it is also used in fumigations, to purify a vitiated atmosphere. The Laplanders cut the outer bark into thongs, of which they manufacture ropes, baskets, and other utensils; and it even forms some part of their wearing apparel: it is also used in dyeing; and, as a substitute for oak-bark, in tanning. The Swedish housewives employ this bark, after burning it to a certain degree, as a cement for broken china, or earthen-ware. When boiled with alum, it affords a dye of a dark-red colour. DAMBOURNEY asserts, that the bark is better for tanning, when

dried, than in a fresh state. For this purpose, it is cut into small pieces, and boiled for half an hour in pure water; and the prepared hides are steeped in it, while luke-warm. The ley is again boiled on the two following days, and the steeping of the leather as often repeated; after which it is suspended to dry in the air. Leather thus prepared, is said to be water-proof.

The leaves of the birch give a yellowish colour to wool, which has been previously prepared with alum. Those collected in the spring, however, are not so proper for dyeing, as the autumnal leaves, because, the former produce a greenish tinge; but the latter afford a beautiful yellow colour. They have also been used in the dropsy, itch, &c either applied externally, or in decoctions taken by the mouth.

The fungus which grows on the trunk of the birch-tree, is a very good styptic; and when boiled in water, beaten, and dried in an oven, it makes excellent touch-wood.

Birch-twigs are used for fishing rods and brooms; as well as by bird-catchers, who smear them with bird-lime.

Birch Wine was formerly in considerable repute, as a remedy for nephritic disorders, but is disused in modern practice. As it is a rich cordial, and, according to Dr. NEEDHAM, an excellent remedy for consumption, and the scurvy, we shall acquaint our readers with the method of preparing it; though we have no experience of its medicinal powers.

The juice or sap of the birch-tree, should be extracted about the beginning of March, when the buds begin to swell, and before they have opened their leaves. An incision, or hole must be made in the trunk, almost as deep as the pith, under some branch of a well-spreading tree, on its south-western side, and about one foot above the ground: a hollow tube should then be fitted to the aperture through which the sap will flow similar to distillation. On applying a little mould to the orifice the wound will heal, and the bark afterwards closes Some persons are of opinion, that the sap drawn from the trunk of the tree, is not so pure as that obtained from its higher branches To prevent this juice from fermenting, till a sufficient quantity is procured, the bottles in which it is collected ought to be immediately stopped

One of the best methods of making birch-wine is as follows; to every gallon of the sap, add a pint of honey, or a pound of sugar; stir the whole together, and boil it for an hour with a few cloves, and a little lemon peel; at the same time carefully scum the rising impurities. When cool, a few spoonfuls of new ale should be added, to induce a proper degree of fermentation; and, after the yeast has settled, the wine should be bottled up, and kept for use. If this liquor be prepared with proper attention, it becomes so strong that the common stone bottles, into which it is decanted, frequently burst.

BIRCH-TREE (Dwarf,) or, *Betula nana*, L. which grows on moist heaths, and rarely exceeds three feet in height. It has roundish leaves, tender branches, a smooth bark, and its flower catkins are uncommonly small: this diminutive tree, however, is more common in the marshy parts of Russia, Sweden, and on the mountains of Lapland and Norway, than in Britain. From its fibrous roots, the Norwegians and Laplanders manufacture very beautiful carpets; and its leaves are said to produce a more delicate yellow colour, than those of the common birch.

BIRD is a biped animal, provided with a bill, and covered with feathers, having two wings, by which it is enabled to fly, except in a few instances. The science which treats of birds, in general is called *Ornithology*: to which article we refer the reader, for farther particulars respecting the feathered tribe. But the uses, &c. of the various species, will be stated under their different heads.

Sir Ashton Lever's Method of preserving Birds and Beasts.

BEASTS. Large beasts should be carefully skinned, with the horns, skull, jaws, tail and feet, left entire; the skins may then either be put into a vessel of ardent spirit, or else rubbed well in the inside with a mixture of salt, alum, and pepper, and hung to dry. Small beasts may be put into a cask of rum or any other spirit.

BIRDS Large birds may be treated as large beasts, but must not be put in spirits. Small birds may be preserved in the following manner: take out the entrails, open a passage to the brain, which should be scooped out through the mouth; introduce into the cavities of the skull, and the whole body, some of the mixture of salt and alum, and pepper, putting some through the gullet and whole length of the neck; then hang the bird in a cool airy place, first

by the feet, that the body may be impregnated by the salts, and afterwards by a thread through the under mandible of the bill, till it appears to be sweet; then hang it in the sun, or near a fire; after it is well dried, clean out what remains loose of the mixture, and fill the cavity of the body with wool, cotton, or any soft substance, and pack it smooth in paper. The paper should be dipt in weak spirit of wine, common rum, or whiskey, containing 16 grains of sublimate to the pint.

To breed Canary Birds.

Canary birds, that are kept tame, will breed three or four times in the year; they usually begin in April, and breed in May and June, though sometimes in July and August.

Towards the middle of March, begin to match your birds, putting one cock and one hen into a small cage; and when they have been so long together, they are perfectly reconciled and well pleased with each other; towards the end of March or beginning of April, put them into the breeding cage for that use, let it be full large, so that the birds may have the more room to fly and exercise themselves: let there be two boxes in the cage for the hen to build in, because she will sometimes hatch a second brood before the first are fit to fly, leaving the care of them to the cock, to feed and bring them up, whilst she breeds in the other box; therefore if she has not a spare box to build in she will be apt to make her nest upon the birds, (as it sometimes happens) and smother them, or build so near that they will spoil one another. Whilst your birds are a-pairing, feed them with soft meat, eggs, bread, maw-seed, and a little scalded rape-seed, hardly a third part of egg; this last, and the bread, grated fine, and so mix it together.

When they have young ones, give the same soft victuals fresh every day, and let them have fresh greens likewise, such as cabbage, lettuce, now and then; but give them more constantly chickweed with the seeds upon it; towards June, shepherd's-purse; in July and August, plantains; and before they have young ones, give them groundsel, with the seeds upon it.

I would recommend to such persons who breed only a few birds for their own diversion, to use very large cages, it being much the best way; but those who intend to breed a number should prepare a room for that purpose.

Let the situation of it be such that the birds may enjoy the benefit of the morning sun, which is both delightful and nourishing, and let wire, instead of glass, be at the windows, that they may have the advantage of the air, which will add to their health, and make them thrive the better; keep the floor of the room clean, sometimes sifting fine gravel or sand, and often removing the dung and the other foul stuff. You must take care to fix nest boxes and back cages, in every convenient corner and place in the room, at least twice the number that you have of birds, that they may have the more variety to choose a lodging to their minds, for some love to build high, and some very low, some in a light place, and others will choose a dark place to build in.

There ought to be two windows in the room, one at each end, and several perches, at proper distances, for the birds to settle upon as they fly backwards and forwards.

You may set likewise a tree in some convenient part of the room, it will diver the birds, and some of them will like to build in it, you may observe that their nest is secure from falling through, and if in danger, tie the tree closer, to prevent it, and they will hatch there as well as in any other place.

Remember not to put too many birds together; eight or ten pair are enough for a middling room. When your birds are first paired, as directed before, turn them into the room where they will live, as it were, a conjugal life; and notwithstanding there are several male and female birds in the same room, one cock and one hen, as they first couple together, will keep constant to each other, and both concur and assist in sitting and feeding their young, for the cock-bird takes his turn in building the nest, setting upon the eggs, and feeding the young, as well as the hen.

Of their nests and how to order their young.—You must furnish the birds with stuff for making their nests, such as fine hay, wool, cotton, and hair; let these materials be thoroughly dry; then mix and tie them up together in a net, or some such thing, so that the birds may easily pull it out as they want it, and let it be hung in a proper place in the room for that purpose.

They build a pretty nest, about which they will sometimes be so industrious, as to begin and finish it in one day,

though they are generally two or three days in making their nest; the hen lays commonly four or five eggs, and sits fourteen days.

When the young are hatched, leave them to the care of the old ones to nurse and bring up till they can fly, and feed themselves.

The hen, as I said before, by reason of their rankness in being kept together, and provided with all things necessary at hand, without any trouble in seeking their food, &c will sometimes build and hatch again before the first can shift for themselves, the care of which she transfers to the cock-bird, who will feed and nurse them himself, supplying the part of both parents, while she brings on and attends her new progeny; but it is not so with those birds that live at large in the fields, they observe their season for breeding, and after they have hatched, company with their brood till their young are grown up, and able to provide for themselves.

When the young canary birds can feed themselves, take them from the old ones, and cage them; if they are flying about the room, to catch them bring a spare cage with some soft victuals in it, taking the other meat that is in the room away, and placing the cage there in its stead, with the door open, and a string fastened thereto; then stand at a distance, and the old ones will presently, for the sake of the meat, entice the young ones into the cage; then pull the string, and shut in as many as you can, and catch them.

Let their meat be the yolk of an egg hard boiled, with as much of the best bread, and a little scalded rape-seed; when it is boiled soft, bruise the seed fine, and put a little maw-seed amongst it, and mix it all together, and give them a sufficient quantity fresh every day; never let it be stale or sour: besides this give them a little scalded rape-seed, and a little rape and canary by itself You may keep them to this diet till they have done moulting, and afterwards feed them as you do the old ones, unless at any time they are sick, then continue it.

Bird-Call is a stick split at one end, and containing a leaf of some plant, by which the notes of different birds are imitated, and they are thus attracted to the net, snare, or lime-twig Thus, a laurel-leaf fitted to the bird-call, enables a skilful whistler to produce accents resembling those of lapwings, a leek, those of nightingales, &c.

Bird-Catching is the art of taking birds, whether for the table, for the pleasure of their song, or with a view to destroy them, on account of their depredations—This art is practised by several persons in the vicinity of large towns, for a livelihood; and is now reduced to a degree of systematic perfection It is, however, attended with considerable expense. We shall, therefore, as concisely as possible, describe the ingenious contrivances of bird-catchers, chiefly for the information and amusement of our country readers.

The nets are a most curious invention, about twelve yards and a half in length, and two and a half wide: the birds are caught by the nets flapping over each other

Wild birds *fly*, as the bird-catchers term it, chiefly during September, October, and November; and also in March, though not in such abundance. The pippet, a small species of lark, appears in England, about Michaelmas, and is succeeded by the wood-lark, linnet, gold-finch, chaff finch, &c none of which can be caught in great numbers at any other time. The birds, are generally on the wing from day break till noon; and as they always fly against the wind, there is great contention among the bird-catchers, to obtain the best situation; for example, if the wind be westerly, the person who arranges his nets farthest to the east, uniformly has the greatest success

The bird-catcher is generally provided with five or six linnets, two goldfinches, two green-finches, one woodlark, a red-pole, yellow hammer, and, perhaps, a bull finch: these are placed at short distances from the nets, in small cages: he has. besides, what are called *flur-birds*, which are fastened to a moveable perch, placed within the net, where they can be raised at pleasure, and gently lowered when the wild bird approaches

As there is known to be a superiority between different birds of the same species, with respect to their song, bird-catchers always contrive, that their call-birds may moult before the usual time. This is effected by putting them into a close box for a month, under two or three folds of blankets, and leaving their dung in the cage, to increase the heat. In consequence of premature moulting, the captive bird not only begins to sing at a time when the wild ones are out of song, but his notes likewise are louder and more shrill than theirs.

Having arranged his nets, the bird-catcher disposes the call-birds at proper

intervals; as their sight and hearing is infinitely superior to his own. As soon as the wild-birds are perceived, notice is given by one of the call-birds to the rest; they invite the wild ones by what is called *short jerks:* this invitation is so strong, that the latter are stopped in their course, and, it frequently happens, that, if half a flock only are caught, the remainder will immediately afterwards alight in the nets.

Nightingales are not birds of flight: like the wren, and other singing birds, they only move from hedge to hedge; and are caught by a trap net, somewhat larger than a cabbage-net, and the bottom of which is surrounded by an iron ring: the trap is baited with a meal-worm.

The common way of taking larks is by nets, called *trammels,* which are thirty-six yards long, and six yards broad; they have six ribs of pack-thread, which are fastened to poles at the ends about sixten feet in length. A net thus prepared, is in the night drawn by five or six men over the ground, which it is made to touch at short intervals When the birds fly up against the net, it is let down, and all under it are taken; such as woodcocks, snipes, partridges, quails, &c. Larks in the day time are caught in clap-nets, fourteen or fifteen yards long, and two and a half wide. They are enticed by a decoy lark, and likewise by small fragments of looking glass fixed in a piece of wood, and placed in the middle of the net, so as to receive a quick and circular motion by means of a string This net, however, is employed only till the second week in November, as larks do not sport in the air, except in fine weather. But in gloomy days the larker changes his engine, and makes use of a trammel net, about twenty-seven feet long, and five broad; which is fixed on two poles, eighteen feet long; and carried by men, who, when passing over the fields, and perceiving a lark hit the net, drop it, and thus secure the bird

Water fowl are caught in prodigious numbers on the Orkneys and islands of Scotland, where the dangers of the situation, the dexterity of the adventurers, and the quantity of the prey, are equally objects of surprise. On the Feroe-islands, more especially, those characteristics are extremely remarkable. The cliffs which contain the objects of search, are often two hundred fathoms in height. They are assaulted from above and below In the first case, the fowlers provide themselves with a rope 80 or 100 fathoms in length. One of the party fastens one end about his waist and between his legs, recommends himself to the protection of the Almighty, and is lowered down by six others, who place a piece of timber on the margin of the rock, to prevent the rope from wearing against the sharp edge. They have, beside, a small line fastened to the body of the adventurer, by which he gives signals that they may lower or raise him, or shift him from place to place. The last operation is attended with great danger, by the loosening of the stones, which often fall on his head, and would infallibly destroy him, was he not in some degree protected by a strong thick cap; but even that is found unequal to shield him against the weight of the larger fragments of rock. The skill and agility of the fowlers is amazing: they will place their feet against the front of the precipice, and dart themselves some fathoms from it; with a cool eye survey the places where the birds nestle; and again spring into their haunts. In some instances, the birds lodge in deep recesses. The fowler will alight there, disengage himself from the rope, fix it to a stone, collect the booty, fasten it to his girdle, and at his leisure resume his pendulous seat. At times, he will again shoot from the rock, and, so doing, with a fowling-net placed at the end of a staff, catch the old birds that are flying to and from their retreats When he has finished his daring enterprise, he gives a signal to his friends, who pull him up, and share the hard-earned profit The feathers are preserved for exportation. The flesh is partly eaten fresh but the greater portion dried for winter's provision. The fowling from below has its share of danger. The party goes on the expedition in a boat; and when it has gained the base of the precipice, one of the boldest, having fastened a rope about his waist, and furnished himself with a long pole with an iron hook at one end, either climbs, or is thrust up by his companions, who hoist him, by means of a pole, to the next footing-spot he can reach. He, by means of the rope, brings up one of the boat's crew; the rest are drawn up in the same manner: and each is furnished with his rope and fowling-staff. They then continue their progress upward in the same manner, till they arrive at the region of the birds, and wander about the face of the cliff in search of them. They then act in

pairs. One fastens himself to the end of his associate's rope, and in places where birds have nestled beneath his footing, he permits himself to be lowered down, depending for his security on the strength of his companion who has to haul him up again. They fling the fowl into the boat, which attends their motions. They often pass seven or eight days together in this employ, and lodge in the crannies which they find in the face of the rocks.

The following manner of taking birds alive, by means of a *fusee* or *musket*, is so ingenious, that we shall communicate it to our readers It was invented by M. de VAILLANT, during his travels in Africa: if his plan be practicable, it will certainly facilitate the researches of the Ornithologist. Put a smaller or larger quantity of gun powder into the musket, according as circumstances may require. Immediately above it, place the end of a candle, of sufficient thickness, ramming it well down; and then fill the barrel with water up to the mouth. When at a proper distance fire the musket thus loaded at a bird, which will only be stunned, by watering and moistening its feathers, and may be easily laid hold of, before it has time, by fluttering, to injure its plumage.

The only remark now to be made upon birds is with respect to their very great utility in destroying the numerous tribes of insects, which prove so injurious to the fruit and fruit trees in the United States. For this benefit, they are entitled to our protection, instead of meriting the wanton destruction to which they are continually exposed by the idle and inconsiderate. Many of those birds which seem to court our protection, by building their little nests about our houses, are especially entitled to our gratitude. The *motacilla sialis*, or blue bird, &c. *Certhia familiaris*, or house wren, deserve particularly to be noticed. These birds live almost entirely on insects, many hundreds of which are daily devoured by them.

All the species of *Motacilla*, are also great devourers of insects; in that genus are included among others *m. mitrata*, hooded tittmouse, *m. canadensis*, black throat warbler, or blue fly catcher; *m. regulus*, or golden crowned wren. The numerous families of *Fringilla*, in which are included, the finch, sparrow, and titt, or chirping birds, and the tribe of *Parus* or tittmouse, are not less useful. But probably the most valuable of all birds is the *Caprimulgus Virginianus*, night hawk, or whip-poor-will; this bird lives almost entirely on insects, and particularly deserves our protection, for it chiefly flies about in the evening, at which time only, many destructive insects make their appearance, and which would escape the birds of the day.

The common blue jay of our country is also very useful, in destroying the cockchaffer, *scaraboeus melolontha*, of which that bird is very fond.

BIRD CHERRY, or the *Prunus Padus*, L is a species of cherry-tree.

It attains a height of fifteen or twenty feet, is of a shrub-like growth, with a branchy top; its leaves are large, oblong, rough, and serrated; the fruit large and red. See WITH. 455

From the fruit of the bird cherry an agreeable wine may b produced: and it is affirmed in the Transactions of the Swedish Academy, for 1774, that its kernels, when deprived of their external rind, afford so good a substitute for almond milk, that the most experienced persons cannot ascertain the difference. Its wood is much used on the continent, by cabinet-makers and upholsterers; its inner bark affords a green lixivium for dyers See CHERRY.

Bird-grass. See Roughish MEADOW-GRASS.

BIRD-LIME is a viscid matter used for catching birds. There are different ways of preparing this substance, but it is generally made of holly bark, which is boiled ten or twelve hours; and when its green rind is separated, it is covered up in a moist place, to stand for a fortnight. It is afterwards reduced to a tough paste, and washed in a running stream, till no impurities appear. Next, it is suffered to ferment for four or five days, during which it must be frequently skimmed. Afterwards it is mixed over the fire, with a third part of nut-oil, or thin grease, and thus rendered fit for use

Dr. DARWIN observes, that this resinous material possesses uncommon adhesiveness to feathers, and other dry, porous bodies; whence it has obtained the name of *bird-lime*. It much resembles the *caoutchouc*, or elastic resin, imported from South America; and is also similar to a fossil elastic bitumen found near Matlock, in Derbyshire; both in its elsaticity and inflammability. He farther suggests, that holly may be worth cultivating, both for its wood, and the quantity it contains of this elastic matter. On this occasion the Doctor mentions a remarkable fact, de-

serving the attention of rural economists. About thirty years ago, a person who purchased a wood in Yorkshire, sold the bird-lime prepared from the bark of the numerous holly-trees, to a Dutch merchant, for nearly the whole sum given for the wood. If, therefore, this substance could be hardened, it might probably be substituted for the caoutchouc, or India-rubber.

The German method of preparing bird-lime is, by putting about two pounds of linseed oil into a pot, to simmer upon the fire for some time, after which it is taken off, and lighted with a match. In this state of inflammation, it continues about two hours, when half the quantity will be consumed. By dipping from time to time, a stick into the oil, and trying the matter between the fingers, its proper glutinous consistence may be easily ascertained; on which the pot is covered, and the flame extinguished.

Water bird-lime may be prepared as follows: Take a pound of strong and good ordinary bird-lime, wash it thoroughly in spring-water, till it become perfectly soft, next beat it well, that the water may be entirely separated; then dry it, put it into an earthen pipkin, and add to it as much capon's or goose grease as will render it fluid. In this state of the preparation, add two spoonfuls of strong vinegar, one spoonful of oil, and a small quantity of Venice turpentine. Let the whole boil for a few minutes over a moderate fire, stirring it during that proces. Then take it off; but previous to its use, warm it, and cover the twigs with it in every direction. This is the best bird-lime for snipes or such birds as frequent marshy places.

The proper method of using bird lime is, to cut down the principal branch of a tree, the twigs of which are straight, long, and smooth. The willow and birch are the best for this purpose. After the superfluous shoots have been lopped, and the twigs cleaned, they must be uniformly covered with the bird-lime, to within four inches of the bottom; but the main stem should not be touched by this matter. Great care is required in laying it on properly; for, if too thick, it will alarm the birds, and prevent their approach; and, if too small a quantity be applied, it will not hold them when they settle upon it. The branch thus prepared must be erected in a hedge or among some growing bushes. If employed in summer, it should be placed in a quickset hedge, in groves, bushes, or white-thorn trees, near corn fields, &c. but in winter the best spots, are near stacks of corn, sheds, or barns. The sportsman ought to stand as near the limed bush as possible, and imitate the notes of birds with a call. When a bird is attracted to the bush, and entangled by the lime, the sportsman should suffer it to remain; as by the fluttering it makes to disengage itself, others will be attracted to the bush, and thus several may be taken together. The hours proper for this sport, are from sun-rise till ten o'clock; and from one, to sun-set. Another method of attracting birds is, by a *stale*; a bat makes a very good stale, but it must be fixed so as to be perceptible at a distance. An owl is still more eligible for this purpose, being followed by the small birds, whenever it appears. If a live owl, or bat, cannot be obtained, the skin of one stuffed will likewise answer; nay, even the image of an owl carved in wood and painted of the natural colour, will produce the desired effect.

When the German composition is used, care should be taken to seize the bird, when entangled, to prevent it from attempting to free itself by its beak; otherwise it will be destroyed by the deleterious effects of the oil.

Singing-birds (in England) are principally the nightingale, black-bird, thrush, starling, linnet, lark, red-breast, canary-bird; bull-finch and gold finch. Their first note is termed *chirp*, which is repeated at short intervals: the second is denominated *call*, being a repetition of the same note, and the third sound is termed *recording*, which a young bird will do for nearly a twelvemonth, and when perfect in his lesson, he is said to *sing his song round*. Their notes are not more natural to birds, than language is to man; and they all sing in the same key.

Preservation of Birds. Various methods have been attempted by naturalists, to preserve animal substances from putrefaction; but, from the want of a proper antiseptic, many curious animals, and particularly birds from foreign parts, are imported in a very imperfect state. The following process appears to be the most easy and effectual:

After opening the bird, by a longitudinal incision from the breast to the vent, dissecting the fleshy parts from the bones, and removing the entrails, eyes, brains, and tongue, the cavities, and inside of the skin are to be sprin-

kled with the following powders: Take of corrosive sublimate ½ lb. pulverised lime ½ lb burnt alum ¼ lb flowers of sulphur ½ lb. camphor ¼ lb black pepper, and coarsely ground tobacco, one pound each; mix the ingredients well together, and keep them in a glass vessel closely stopped First insert the eyes and stuff the head with cotton or tow; then pass a wire down the throat, through one of the nostrils, and fix it into the breast-bone: wires are likewise to be introduced through the feet, up the legs and thighs, and fastened into the same bone; the body is afterwards stuffed with cotton to its natural size, and the skin sewed over it. In whatever position the bird is placed to dry, the same will afterwards be retained.

Small birds may be preserved in brandy, rum, arrack, or first runnings; but by these means, the colour of the plumage is liable to be extracted by the spirit. Large sea-fowl have thick strong skins, and such may be skinned; the tail, claws, head and feet, are to be carefully preserved, and the plumage stained as little as possible with blood. The inside of the skin may be stuffed as recommended above.

Mr Bancroft, in his Natural History of Guiana says, that several persons in the colony are advantageously employed in preserving a variety of beautiful birds for the cabinets of European naturalists. Their method is, to put the bird in a proper vessel, and cover it with strong wine, or the first running of the distillation of rum, in which it remains for twenty-four or forty eight hours, till the liquor has penetrated every part of its body. The body is then taken out, and its feathers, which are not in the least injured by this immersion, being placed smooth, it is put into a machine made for the purpose, and the wings, tail, &c. arranged agreeable to nature. In this position, it is placed in an oven moderately heated, where it is slowly dried, and will ever after retain its natural attitude, without danger of putrefaction.

The following simple composition may be employed with success, for the same purpose: Common salt one pound, powdered alum, four ounces, ground pepper two ounces. The bird intended for preservation, should be opened from the lower part of the breast-bone to the tail, with a pair of sharp-pointed scissars, and the whole of the intestines taken out. The cavity is then to be filled with the mixture, and the lacerated part should be properly stitched The thorax, from the beak to the stomach, must be filled with the same composition, reduced to a fine powder. The head is to be opened near the root of the tongue, with the point of the scissars, and the structure of the brain destroyed, by moving them in a circular direction, and as soon as they are withdrawn, the cavity is likewise to be filled with the mixture. After having been suspended by the legs, for a few days, the bird may be fixed in a frame, in its natural attitude [The best preparation is a solution of camphor with corrosive sublimate in spirit of wine.—T. C]

Bird's Eye See Primrose.

BIRDS NESTS, in cookery, the nest of the hirundo esculenta or Indian swallow, very delicately tasted, and frequently mixed among soups. On the sea-coasts of China, at certain seasons of the year, there are seen vast numbers of these birds. They leave the inland country at their breeding time, and come to build in the rocks, and fashion their nests out of a matter which they find on the shore, washed thither by the waves The nature of this substance is scarcely yet ascertained. According to Kempfer, it is molluscæ or sea-worms: according to M. le Poivre, fish-spawn; according to Dalrymple, sea-weeds; and according to Linnæus, it is the animal substance frequently found on the beach, which fishermen call blubbers or jellies The nests are of an hemispheric figure, and of the size of a goose's egg, and in substance much resemble the ichthyocolla or isinglass. The Chinese gather these nests, and sell them to all parts of the world; they dissolve in broths, &c., and make a kind of jelly of a very exquisite flavour.

BIRMAN Empire comprises the kingdoms of Ava and Pegu, in the country formerly called India beyond the Ganges. The subjects of this empire are about 15 millions. [We get from thence a mineral bituminous oil, or petroleum, used as an embrocation for rheumatism —T C.]

BIRTHWORT, (Slender) or *Aristolochia clematitis*, L. has heart-shaped leaves, an upright stem, and its root is long and slender. See *Eng. Bot* 398.

On being chewed, the Birthwort instantly imparts an aromatic bitterness, not ungrateful to the palate. It possesses medicinal virtues, and is prescribed as an attenuant of viscid phlegm, and promoter of the fluid secretions.

The dose in substance is from a scruple to two drachms. There are four other species of this plant imported for medicinal purposes, particularly the *Aristolochia longa*, a native of France, Spain and Italy. It is applied externally in cutaneous diseases, as likewise for cleansing and healing wounds and ulcers. (See SNAKE-ROOT).

BISCUIT, a kind of bread manufactured by confectioners, of fine flour, eggs, sugar, and rose or orange water; or of flour, eggs, and sugar, with aniseeds and citron-peel.

Sea Biscuit, a sort of hard, dry bread, formed into flat cakes: when intended for long voyages, it is four times baked, six months before it is shipped; after which it will continue good during a whole year. In order to preserve such bread from insects, Mr. HALES recommends the fumigation of the casks with sulphur, after they have been filled. Biscuits may likewise be preserved by packing them in casks well caulked and lined with tin.

As the manufacture of sea biscuits is of considerable importance to a maritime country, we shall communicate the method of baking practised in France.

In the preparation of biscuit, a proportion of ten pounds of leaven (rather more stale than that commonly used for bread), is diluted in warm water, with one hundred pounds of flour, which is kneaded; but the water should be added by small portions, to prevent the necessity of adding more flour; when the dough can no longer be worked by the hand, it is pressed with the feet till it is perfectly smooth, glutinous and compact. The kneading being finished, the dough is worked up in parts: at first it is formed into rolls, which again pass through the hands of the baker; this is called *rubbing*. When the weight of each piece is determined, it is made round, flattened with a rolling pin, and then placed on a table or board exposed to the fresh air, in order to prevent too quick fermentation. Care is taken that the oven be less heated for the baking of biscuit than bread: and as soon as the last cake is formed, that which has been first made, is pierced with several holes, with the point of an iron, which at once flattens it, and gives vent to evaporation; it is then placed in the oven. The biscuits are kept there about two hours, and when drawn out they are packed with great caution in boxes, lest they should break. Each box commonly contains either a half or a whole quintal; and, when filled, is placed in a close, warm room, with which the heat of the oven has a communication. The biscuit here parts with its superabundant moisture, and undergoes what is called a *sweating*.

A good biscuit breaks clean and crisp, has a shining appearance within, and the outside is glossy. When soaked, it swells considerably in the water, without crumbling, or sinking to the bottom of the vessel.

As the composition of biscuit is connected with the general principles of making bread, we shall only observe, that the defects which prevail in many bake-houses are similar to those where biscuit is prepared; such as an imperfect grinding, which leaves the bran in the flour, or the flour in the bran, and injures the manufacture. Ovens too high, and not closely stopped, consume much fuel, and produce an indifferent baking.

One of the first rules in the preparation of biscuit should be, never to make it of any but choice wheat, very clean, and *dry*, because it ever continues to carry with it this original principle of preservation; while wheat, which is naturally moist, be it ever so well ground, and worked, has a tendency to become worse. For this reason rye and maize are unfit to be manufactured into biscuit.

It must be confessed with regret, that sea-biscuit of the best preparation, often carries in it a principle of destruction. Sometimes it is in the bran, which occasions insects, and hollow spaces in the interior part of the biscuit, giving it a disposition to mould: and sometimes it is a want of cleanliness which prevails in the bread-room of the vessel. See SHIP-BREAD.

M. CARDON, a biscuit-baker of Hesse, in conjunction with four others of the business, has recently made some experiments, the result of which is, that 100 lb. of flour give 126 lb. of dough, which, divided into cakes of eight or nine ounces, when well baked, afford 90 lb. of biscuit. Instead of making use of old leaven, and of ten or twelve pounds weight to each quintal of flour, he recommends to use the leaven while fresh, in a quantity of fifty pounds, and to make the dough less firm, that it may be kneaded with more ease. He has shewn biscuit, made after this manner, to several masters of ships, who have found it excellent, and that it stands the test of floating on the

surface of water, without falling to pieces.

BISHOP, a prelate, or person consecrated for the spiritual government and direction of a diocese. The word comes from the Saxon *bischop*, and that from the Greek *episcopos*, an overseer or inspector, which was a title given by the Athenians to those whom they sent into the provinces subject to them, to look into affairs. The Romans gave the same title to those who were inspectors of the bread and provisions. It appears from a letter of Cicero, that he himself had a bishopric, being *episcopus Oræ et Campaniæ.*

BISMUTH, or Tin-glass, one of the semi metals, of a reddish or light yellow colour, and a lamellated texture: it is moderately hard and brittle, so that it breaks under the hammer, and may even be reduced to powder.

It is very fusible, and soluble in the vitriolic, muriatic, and nitric acids, particularly in the last, and when dissolved in it, is precipitable by a mere dilution with pure water; the precipitate is white, and is commonly called Magistery of Bismuth; it forms the *flake white*, and is too often employed as a paint for the complexion under various names, but is a bad substitute for temperance, exercise, and early hours, as it frequently turns black by the animal transpiration, and certainly so, by an exposure to sulphurated hydrogen gas, which is met with in those mineral waters called "sulphur springs," and in privies. Flake white, when mixed with suet or fat, is more innocently used to blacken the hair. Bismuth, dissolved in the acids, forms pellucid sympathetic inks, which become black by exposure to the vapour of alkaline sulphurets.

Most metallic substances, by an union with bismuth, become more fusible; hence it is used in the making of solder, printer's types, pewter, &c. [Eight parts bismuth, five of lead, and three of tin fused together, melt in boiling water.—T. C.]

Bismuth reduced to powder, mixed with the white of eggs, and applied to wood, gives it the appearance of being silvered, when it is gradually dried, and rubbed with a polisher.

This semi-metal is commonly deposited in cobalt ores, which when of a high red colour, are called *bismuth bloom*, or *flowers of bismuth.* To this mixture may be ascribed the property which bismuth-ore has of making sympathetic ink, similar to that formed by a solution of the regulus of cobalt. See INK.

In dyeing, a solution of Tin-glass in aqua fortis has lately been recommended by DAMBOURNEY, for fixing certain colours on wool, in preference to alum, or other neutral salts. See DYEING.

In medicine, the calx and flowers of bismuth were formerly used, in cases where antimonial preparations are now employed with greater safety, and equal effect; so that the former are at present, chiefly converted into pigments and cosmetics. Nevertheless, we are possessed of the most convincing proofs, that the *magistery* of *bismuth* is one of the most powerful antispasmodics, especially in cramps of the stomach. When cautiously administered, in doses from half a grain to one grain, in simple water, repeated every half hour, or oftener, according to circumstances, it affords speedy relief in the most excruciating pain; and is, in this respect, of superior efficacy to the celebrated flowers of zinc. But we think it our duty to repeat, that both medicines require the greatest precaution.

The very great utility of bismuth in the arts of dyeing, and particularly in the manufactory of types, which is yearly increasing in the United States, will cause a considerable consumption of this mineral.

BISON, AMERICAN, (*Bos Americanus*) is a large species of ox, with round and distant horns which point outward, a long and woolly mane, and a large fleshy protuberance on the shoulders.

These animals inhabit in immense herds the savannahs and marshes of the interior of North America.

As they are capable of being domesticated, and in this state are sufficiently tractable for the purpose, they are sometimes rendered useful for agricultural labours. The hunting of the wild bison is a common and very arduous employment of the natives of the interior of America, particularly those living adjacent to the rivers Mississippi and Ohio. Their *flesh* is used as food, and the fatty protuberance on the shoulders is esteemed a great delicacy. The *tongues*, which are reckoned superior to those of oxen, are frequently transported to New Orleans, where they always have a ready sale. When the animals are quite fat they are said to yield sometimes as much as 150 pounds' weight of *tallow*. The latter is so important an article of commerce that, in many instances, the hunters cut out only the tongues and tallow

leaving the remainder of the carcass to be devoured by wild beasts. Powder-flasks are made of the *horns*. The *skins* are capable of being converted into an excellent buff leather; and, when dressed with the hair on, the lighter skins serve the Indians as beds, and for clothes, gloves, and shoes. Some persons use them as blankets, and find them a very warm and pleasant covering. The *hair* is spun and woven into various articles of clothing, which are both durable and useful, and are peculiarly soft and pleasant to the wearer.

BISSEXTILE, or LEAP-YEAR, a year consisting of 366 days, and happening every fourth year, by the addition of a day in the month of February, which in that year consists of 29 days. And this is done to recover the six hours which the sun takes up nearly in his course, more than the 365 days commonly allowed for it in other years. See CHRONOLOGY.

BISTORT, (Great), or Snake-weed; the *Polygonum bistorta*, L. a species of knot-grass, most plentiful on meadows and pastures: it has a thick oblique root, about the size of a finger, blackish brown without, and reddish within; a simple round, slender stem, nearly two feet high; oval leaves, and the stalk terminates in thick short spikes, of whitish red flowers, which appear in July, and are productive of seeds in August. See WITHERING, 382, and *Engl. Bot.* 509.

As this indigenous plant is subservient to many useful purposes, we have been more particular in its description, than the limits of our work will permit on future occasions.

Cattle and sheep are exceedingly partial to the herbage of the Great Bistort; but horses will not eat it. The young leaves are excellent for culinary use; and a small quantity of the root, reduced to powder, and added to the dough in baking, communicate an agreeable taste to the bread, and improves its salubrity.

The Great Bistort has likewise been usefully employed in the arts of dyeing and tanning. According to GLEDITSCH and BAUTSCH, two creditable authors, the herb with its blossom has, by tanners on the continent of Europe, been found to be a proper substitute for oak-bark; and DAMBOURNEY assures us, that from the root of this plant he obtained a decoction of a *mordore* shade, in which he dyed wool of a real beaver colour, after having previously immersed it in a ley, saturated with a solution of Bismuth.

All the parts of this plant have a rough, austere taste: the root, in particular, is one of the strongest vegetable astringents produced in England, and, therefore, justly recommended in intermittent fevers, immoderate hemorrhages, and other fluxes, both internally and externally, where the constitution of the patient requires such a medicine. According to a late popular writer, it has often, and especially in agues, been given in larger doses than those commonly administered: he has prescribed it both alone, and together, with gentian, to the amount of three drachms in one day. It is allowed to be a very powerful styptic, and consequently possessed of antiseptic properties; but we doubt, whether it is sufficiently efficacious to supersede the use of the Peruvian bark, or even that of the white willow

BISTORT, (Small,) Welch, or Alpine; the *Polygonum viviparum*, L. it has a smaller root than the preceding species; a simple slender stem, six inches high, spear-shaped leaves, and the stalks and branches terminate by stalks of whitish red flowers, which appear in June or July, and bear seeds in August. See WITH. 383; and *Engl. Bot* 669.

BISTRE, the burnt oil extracted from the root of dry beech-wood, used in drawing, as a brown colour. It is seldom to be had in such a state as to wash freely Its general fault is grittiness, or the admixture of an over-abundance of gum in the preparation, which is an artifice to procure that adhesion which its sandy texture resists. If well prepared, the goodness next to be required is a warm deep-brown colour.

BITE OF A MAD DOG, an unfortunate accident, which but too frequently happens in hot summers or very cold winters, and is supposed to be occasioned chiefly by suffering that faithful animal to feed upon putrid meat, without supplying it with sufficient water; but more probably originates from a specific contagion, like the small-pox, &c. The disease thence arising in the human species, is called Canine Madness, or, according to medical writers, *Hydrophobia;* a term which literally signifies "dread of water."

This virulent disorder does not, in general, manifest itself till a considerable time after the bite, for, though in some instances it has commenced in

seven or eight days after the accident, the patient often continued in health for twenty, thirty, or forty days; nay, sometimes for several months. If the wound be not prevented, it will, in most instances, be healed long before the symptoms of the disease appear; though it frequently resists all healing applications, and forms an ulcer, discharging a quantity of matter. The approach of the disease is known by the cicatrix of the wound becoming hard and elevated, and by a peculiar tingling sensation in the part affected; pains shoot from it towards the throat: in some cases it is surrounded with livid or red streaks, and seems to be in a state of inflammation; more frequently, however, no remarkable external change can be perceived But the patient soon becomes melancholy, prefers solitude, and is troubled with nausea. Sometimes the characteristic symptom of the disease, *the dread of water*, suddenly attacks the patient, and every attempt to swallow liquids, is accompanied with the most painful sensations. This appears to be a circumstance peculiar to the human race; for mad animals do not evince any dread of water.—There is not the least doubt, that the disease is occasioned by the saliva of the mad creature. Unless therefore, part of the true skin be injured, the poison will not be communicated, but in the contrary case, the smallest quantity is sufficient to produce the fatal effect. Hence, if the cuticle has been wounded, it is absolutely necessary to remove the surrounding muscular substance by the knife, and to lose no time in submitting to this operation; as it is the only certain and effectual preventive.—It is, however, of consequence previously to be convinced, whether the animal has been actually mad.

In order to ascertain whether a dog is really infected with that distemper, the following particulars deserve attention. Several days previously to the invasion of the disorder, the animal becomes sullen and shews equal indifference to his master, his food, and drink. His ears and tail droop; instead of barking, he growls and snaps at every surrounding object, runs about irregularly, is no longer able to distinguish his master from strangers, and lolls out his tongue, which is parched, and of a livid hue. At length, he drops down suddenly, starts up again, bites whatever seems to obstruct his passage, and in this condition he seldom survives twenty-four, or, at the farthest, forty-eight hours.

If the disease has actually been communicated by a bite, the patient feels a burning heat in the throat and injured part, according to the degree of violence with which the malady is accompanied. But the proximate cause of the affection appears to be confined to the nervous system, so that patients, labouring under the influence of hydrophobia, have overcome the small pox, and quartan agues, without any aggravation of symptoms.—*Hence opiates, and other narcotics, as is the case in many nervous diseases, produce no effect.* As it is generally allowed, that canine madness, if the dread of water has once taken place, can seldom be cured, the most essential part of the treatment will be the speedy application of preventives. For this reason, we have already stated the immediate necessity of cutting away the parts contiguous to the wound, especially where that operation can be performed, without injuring any large blood vessel. Beside this precaution, the wound should be frequently washed, by pouring cold water upon it from the spout of a tea-kettle, and to prevent the canine virus from remaining about the wounded part, it should be kept open, and a discharge of matter promoted for several weeks; by stimulating ointments, mixed with cantharides, or similar applications.

M. Sabatier mentions an instance in which, by repeated attacks of a mad dog, the patient had received twenty-five wounds, and about fifty scratches these were all radically healed, by the application of the cautery, and of fire, which completely destroyed the poison.

This conclusion (says Dr. Mease,) is highly absurd, because many persons have done nothing for their wounds, and yet remained well.

Indeed it may be safely said, that the actual cautery, burning the wound with gun-powder, washing it with vinegar and water, or lunar caustic dissolved in water, have all been tried, and repeatedly failed to prevent the disease. As general remedies, Dr. Mead's celebrated favourites, ash-liverwort and black pepper, the Ormskirk remedy, the Tonquin composition of musk and cinnabar, mercury, anagalis (pimpernel or chickweed, which see) and many others have again and again been given, without the least success.

The distance of time that elapses between a bite and the appearance of the disease, is very various In a case lately recorded by Dr. Mease, three

years and four months elapsed. See *Med. Rep.* vol. 5. From three to six weeks, however, is the common interval. As there are a number of vulgar errors prevalent respecting this disease, it may be satisfactory to state the truth upon several points.

1st. Neither the part of the body bitten, nor the stage of the animal's disease at the time of the bite, nor the supposed difference of the original virulence of the poison, nor the quantity of it inserted into a wound, have any influence on the rapidity, certainty, or violence of the attack.

Dr. MEASE says, that after much investigation of the history of nearly all the cases of this disease recorded within the last three centuries, from many private communications, and from the circumstances attending an instructive case, which he had an opportunity of observing in the year 1803, he is fully able to make the above positions. Whether the bite be received in the head or foot, during the first hour of the animal's indisposition, or just before death, and whether the wound be large or small, no difference is observed in the appearance of the disease.

2dly. No danger is to be apprehended from the saliva of a human person, or of a dog, falling upon the skin; nor from the breath of either being received into the lungs. The saliva of a dog must be applied to a *broken* surface to infect. The mere insertion of the tooth of a diseased dog, covered with saliva into the flesh, is sufficient to produce the disease; and the late Dr. HUTCHINSON informed me of a case in which it came on in consequence of a dog merely licking a sore on the leg. Another case is recorded in the *Medical Repos.* of the disease being produced by a little dog licking a sore in the ear. In both cases the dogs discovered no symptoms of madness at the time. It is of infinite consequence that all these facts should be known.

3dly. The practice of worming dogs to prevent their being attacked by madness is highly absurd, because quite useless. [It is not useless: it prevents their biting others if they should go mad.—T. C.]

The nature of the present work will not allow of a more extensive detail. The reader is therefore referred to two pamphlets on the subject by Dr. MEASE, and to the *Medical Repos.* vol. i. and v.

As no specific remedy has yet been discovered for the cure of this dreadful disorder, we shall suggest a probable plan of treatment.

Prevention. It is a singular and fortunate circumstance, (as the disease when produced, has always proved fatal) that nearly nineteen out of twenty who are bitten, escape. But this exemption ought not to induce a security which may prevent every precaution being taken to avert it. If the wound be small, and in a part capable of extirpation, no time should be lost in cutting it out, as directed by Dr. WILLICH: if the lower joint of a finger or toe be bitten, take it off without delay. If excision cannot be performed, enlarge the wound, pour water on it from a teakettle for an hour, and keep it open by the stimulating ointment mentioned above for several months; the application of a caustic to the wound *will not answer*, and no internal remedy can *be of the least use.* In case the disease should appear, give three grains of cantharides in a pill, or fifteen drops of the tincture, every hour, diluted with a little broth until a *violent stranguary*, and *soreness* in the *bowels* are produced. Keep up these symptoms until those of the disease have vanished. Broth and mucilaginous drinks, such as flaxseed tea, may then be taken, and clysters of the same combined with laudanum, may be given to heal the irritated bowels: the warm bath may be also used, and bark, wine and generous diet to recruit the strength. The reasons for the above treatment are too long to be inserted here, but may be found in the two pamphlets mentioned before on this subject. It is however proper to observe, that not one of the various modes of treatment hitherto pursued, has ever succeeded. And as the field of experiment is fairly open, it is perfectly warrantable rather to follow the light of analogy and conjecture in pursuit of a new remedy, than to persist in the use of such as are proved to be incompetent and fruitless. The symptoms excited by cantharides, are alarming, but not dangerous unless the remedy be pushed too far. The body should also be anointed with warm oil in a warm room.

There are few diseases, for the cure of which quacks have more successfully imposed upon the credulity of mankind. The reputed success of their nostrums may be referred to the following causes.

1. Every dog that bites is not mad.
2. The part of the body bitten, being covered by clothes, boots, or shoes, by which the saliva is wiped from the tooth, before it reaches the flesh, and

of course the poison is not communicated. In such cases the exemption is attributed to the remedy administered.

3. As mentioned before, it is known that a great many persons bitten by the same dog are never infected with the disease. This is an important consideration, and ought to be attended to in forming an opinion of a remedy. Dogs ought not to be killed after giving a bite, but penned up, in order to discover whether they are actually mad or not. It is also of great importance to keep the mind of the person who may be bitten perfectly easy

The theory of the disease, resulting from the action of the canine poison on the system, is probably more involved in obscurity, than that of any other, to which the human body is liable. How death takes place, has not yet been determined It cannot be from an exhaustion of the powers of life by the spasms, because, as Dr. PHYSICK justly observes, "we see occasionally more muscles in other parts of the body affected with spasms, without any risk being incurred." Dr PHYSICK thinks it is occasioned by suffocation, arising from the spasmodic action of the muscles, of the upper part of the windpipe called glottis; and hence very judiciously proposes to admit air to the lungs, by the operation of tracheotomy: and where the disease has advanced rapidly, and no expectations are entertained of a cure, I would certainly try this plan, which is not attended with any danger if properly performed.

Should the pain in swallowing, continue so excessive, as to prevent the possibility of swallowing, the method suggested by Dr. COXE of supplying nourishment might be adopted. This is, to pass a flexible tube into the stomach, and thus convey liquid food into the system. This tube may remain until the disease shall abate. The same plan has been pursued in France, in cases where violent injuries to the face and mouth, have produced a total inability to take nourishment.

[The difficulty of swallowing, arises from erysepalatous inflammation, in small numerous red sore spots extending from the glottis down the whole course of the œsophagus into the stomach. Profuse bleeding promises most success.—T. C.]

BITTER, is a term applied to substances of a peculiar taste, and generally opposed to sweet; the principal of which are, the Gentian and Bistort-roots, Hops, Lesser Centaury, Carduus, &c.

Most bitters impart their virtues, both to watery and spirituous fluids. By distillation, their taste is in a great measure destroyed; but, on evaporating the watery solution to a thick consistence, the bitter principle remains unaltered, and is frequently improved. See EXTRACTS

Dr DARWIN ingeniously observes, that the bitter, narcotic, and acrid juices of plants, are secreted by their glands, for defending vegetables against the depredations of insects, and larger animals. An acrid juice exists in the husks of walnuts, and in the pellicle, or skin, of the kernel; but not in the lobes, or nutritious part. Bitters appear to have been excluded from the *seed*, lest they might have been injurious to the tender organs of digestion of the embryon plant. In some seeds, however, he adds, there is a bitter quality, which refuses to mix with the oleaginous part; as the oil expressed from bitter almonds is as tasteless as that from the sweet kind.

Vegetable bitters possess the combined properties of astringents and aromatics. Hence they are frequently employed in weakness of the stomach and intestines; in cold habits, where the bile and humours require to be attenuated or diluted; and for promoting natural evacuations, particularly those by the pores and the urinary canal. They are also of service in many cases of indigestion, loss of appetite, flatulency, &c. when these complaints proceed from muscular weakness, or a phlegmatic and inert state of the fluids But, in constitutions where the fibres are tense and rigid, or an immoderate heat and inflammation prevail, the continued use of bitters, especially in the gout, would sensibly increase the disorder, and frequently determine it to the kidneys. Thus the secretion of urine might be greatly checked, to the injury of the patient, and at length either dropsy or consumption would be the natural consequence.

It is not easy to conceive, in what manner bitters taken by the stomach operate on the human system; though they are generally considered as powerful *tonics*. So much is certain, that they do not act as stimulants; because neither the frequency of the pulse, nor the force of the circulation, is increased by their use. Nor can it be main-

tained, that their operation is similar to that of astringents; so that bitters are to be considered purely as tonics, which strengthen, or impart new energy to the muscular fibres of the stomach; an effect which is by sympathy communicated to other parts of the body.

Bitter substances are often used as vermifuges, though seldom efficacious; and externally, as antiseptics In domestic economy, they are, at present, chiefly employed for the destruction of insects, &c.

BITTERN, *Ardea stellaris*, is a bird of the stork tribe, distinguishable by its brownish yellow plumage, variously marked with black, by the feathers of the neck and breast being peculiarly long, and the bill being strong and of brown colour above and greenish beneath

This bird is not quite so large as the heron. It is found in marshes in several parts of England, as well as on the continents of Europe, Asia, and America.

The *flesh* of the bittern was formerly much esteemed at table. Amongst other provisions at Archbishop Neville's intronisation feast, there appear to have been 204 bitterns. These birds are now sometimes to be seen in the poulterers' shops in London, and are generally sold for about half a guinea each. The *hind claws* were once in esteem as tooth picks, from an opinion that the use of them tended to preserve the teeth.

Few birds of their size are more strong, or when attacked are more ferocious than these. They subsist chiefly on fish, frogs, mice, and other animals. During the months of February and March the males make in the mornings and evenings a kind of deep lowing noise, which is supposed to be their call to the females These birds form their nests among rushes, and generally lay four or five greenish brown eggs.

BITTER-SWEET. See WOODY NIGHTSHADE

BITUMENS, are inflammable mineral bodies, not sulphureous, or only casually impregnated with sulphur. They are of various degrees of consistence, and appear in the mineral kingdom, to correspond with the oils and resins in the vegetable. By their peculiar smell, they are easily distinguished from either purely animal or vegetable productions. When the native rock-oils are mixed with concentrated mineral acids, they become thick, and at length consistent: in which state they are called *bitumens.*

Naphtha, or *Rock Oil*, is a yellow or brownish bitumenous fluid, of strong penetrating odour, somewhat greasy to the touch, and so light as to float even on spirit of wine.

By exposure to the air the consistence of naphtha is increased, and it passes into petroleum.

There are copious springs of naphtha at Baku, on the shore of the Caspian Sea; and also in some parts of Italy, particularly at Monte Ciaro, near Piacenza At Pitchford, in Shropshire, extensive strata or beds of sandstone are saturated with this mineral fluid, which is obtained from the stone by distillation, and is sold, as a remedy against sprains and rheumatism, under the name of *Betton's British Oil* By the Persians and Russians naphtha is used internally as a cordial. On the shores of the Caspian it is burnt in lamps instead of oil; and in some countries it is used in the composition of varnish, for the purpose of rendering it more shining.

It is the property of naphtha to burn with great readiness and a white flame, leaving scarcely any residuum If kept in bottles it corrodes the corks.

Petroleum is a fluid bitumen, of somewhat greater consistency than naphtha; of black, brown, or sometimes dingy green colour.

By exposure to the air it assumes the consistence of tar, and is then called *mineral tar*.

This substance exudes spontaneously from the earth, or from clefts of rocks, and is found in nearly all countries, particularly in the East Indies, Italy, France, Spain, Germany, and England. In the neighbourhood of Rangoon, in Pegu, there are several hundred wells of petroleum These are of square form, and each lined with Cassia wood staves. The property of the wells is in the proprietors of the soil, for whom they have been sunk, and are wrought. Some of the wells are of great depth. The oil is drawn from them pure, and in a liquid state, and is conveyed from thence in small jars The whole annual produce of this district is estimated at more than 400,000 hogsheads.

At Colebrook Dale, in Shropshire, there is a considerable spring of petroleum, which was discovered at the depth of about thirty yards beneath the surface of the earth, in digging an archway for the conveying coals from a

very deep pit. It was at first found to ooze from between the crannies of the rock, but it soon afterwards poured forth in a considerable stream. The utility of this fluid being known, large iron pipes were formed for the conveyance of it into pits sunk for the purpose of receiving it. From these pits it is conveyed into immense caldrons, in which it is boiled until it attains the consistency of pitch. Since the first discovery of this substance three different springs of it have broken out. One of these is near the celebrated iron bridge, and the fluid that issues from it is almost pellucid, but, at the same time, is thicker than treacle.

Petroleum easily takes fire, and in burning yields a strong, sharp, and somewhat unpleasant odour; a thick and disagreeable smoke. In cold weather it congeals in the open air.

In Pegu, and other parts of the east, petroleum is used in the place of oil for lamps. Boiled with a species of resin, it is employed for painting the timber of houses, and covering the bottoms of boats and other vessels. In the latter respect it is considered to be particularly efficacious, by protecting the timber from the attacks of marine worms. It is also used by the inhabitants of eastern countries as a lotion in cutaneous eruptions, and as an embrocation in bruises and rheumatic affections. The ancient Egyptians used it in the embalming of dead dodies. In some countries lumps of earth are soaked with petroleum, and are employed as fuel.

Mineral Tar, or *Barbadoes Tar*, is a fluid kind of bitumen, somewhat thicker than petroleum, and nearly of the consistence of common tar. It is viscid, of a black, brownish black, or reddish colour.

In burning, its smell is disagreeable, but less pungent than most of the other kinds of bitumen. Its weight is somewhat greater than that of water.

In the West Indies, where this substance is principally found, it is applied to many of the purposes for which the preceding species is used; but its principal repute is considered to be as a sudorific in disorders of the breast and lungs, though this application of it is considered to be very improper. It is likewise used as an external remedy in paralytic disorders.

Elastic Bitumen, or *Mineral Caoutchouc*, has a strong resemblance to India-rubber. In some instances it is elastic, and so soft as to adhere to the fingers, and in others brittle, and so hard as nearly to resemble asphalt.

Its colour is yellowish, reddish brown, or blackish. One kind of this mineral, when fresh cut, nearly resembles fine cork, both in texture and colour.

This very extraordinary substance, which will expunge the marks of black lead in the same manner as India-rubber, was first discovered about the year 1786, in cavities of the lead mine of Odin, near Castleton, in Derbyshire, and it has not hitherto been found elsewhere. Elastic bitumen appears to be a peculiar modification of petroleum, in its passage to asphalt; and probably owes its elasticity to its cellular texture, and to the moisture with which it is combined.

Asphalt, or *Solid Bitumen*, is a brittle substance, of black or brownish black colour, and of consistence somewhat harder than pitch.

It has nearly the same weight as water, is smooth to the touch, does not stain the fingers, and has little or no smell unless it be rubbed or heated. When heated it melts, swells, and inflames; and, if pure, burns without leaving any ashes.

The ancients were well acquainted with this substance, which is considered to be nothing more than mineral tar in an indurated or hardened state. It is found on the surface of volcanic productions, and floats in solid pieces, and in considerable abundance, on the Asphaltic lake in Syria, which hath thence received its name. This lake is also called the Dead Sea, from a notion that the odour arising from the asphalt destroys even birds which fly over it: Maundrell, however, states that this is not true, since he saw several birds fly about and over it, without experiencing the slightest injury.

Asphalt is also found near ancient Babylon; and there is reason to suppose that the mortar so celebrated amongst the ancients, and with which the walls of Babylon and of the Temple of Solomon were cemented, was nothing more than a preparation of asphalt. We are informed by Herodotus that a composition of heated bitumen, mixed with the tops of reeds, was used by the ancient builders as a cement. This account is confirmed by modern travellers, who assert that the remains of buildings have been discovered in which bitumen was formerly thus employed. It is presumed to be the same substance which, in our translation of the Old Testament, is called pitch, and

which was used by Noah as an exterior and interior coating of the ark; by the mother of Moses as a coating for the little vessel in which he was exposed, and on various other occasions.

As an article of modern utility, it is to be remarked that the Arabians dissolve asphalt in oil, and with the mixture smear their horse harness, to preserve it from the effects of weather, and the attacks of insects. In a state of solution it is applied, in several eastern countries, as a covering for timber and the bottoms of ships. It is occasionally used in the cleansing and healing of ulcers, and other sores. In France it is manufactured into a substance which is in considerable request for greasing the wheels of carriages. It is used by the makers of watch-dials, who mix it with lamp-black and oil of turpentine; but its chief use is as an ingredient in certain varnishes, and particularly in the varnish used by copper-plate engravers. It is frequently adulterated by a mixture with common pitch, but this is easily discovered by the smell.

Besides the countries and places already mentioned, asphalt is found in several parts of America, in the islands of Cuba and Trinidad, in the province of Neufchatel, and many parts of the Continent of Europe.

The other solid bitumens are, amber, jet, and fossil or pit-coal. By distillation, they all yield an odorous water, more or less coloured and saline; an acid frequently in a concrete state, an oil similar to the native rock-oils, but which soon increases in weight, and becomes thicker; and lastly, a quantity of volatile alkali The residuum is a charry matter, differing in appearance, according to the nature of the analysed bitumen.

It is conjectured by naturalists, that all bitumens are of animal or vegetable origin: and that the circumstances by which they differ from the resinous and other oily matters of vegetables and animals, are the natural effects of time: or of an alteration produced on them by mineral acids; or of both causes combined This opinion is the more probable, as bitumens, on a chemical analysis, afford oil and volatile alkali, neither of which is found in any other minerals

BLACK, the darkest of colours, supposed to be owing to the absence of light, as most of the rays which fall on black substances are not reflected, but absorbed by them. In proof and illustration of this hypothesis, it is observed, that "one and the same body assumes different degrees of blackness, according to the disposition of the sensible part of its surface; and in this respect there is not perhaps any other colour which is so much affected by an apparent mechanism. Thus, black velvet, when the pile is raised, appears intensely black; much more so than the silk it was made from; but on pressing the pile smooth it looks pale, and in certain positions shows somewhat even of a whitish cast." The explanation is, that "When the surface is composed of a multitude of loose filaments, or small points, with the extremities turned toward the eye, much of the light is stifled among the interstices between them, and the body appears dark: when the filaments are pressed close, and the surface smoothed and polished, more of the light is reflected from it, and the intenseness of the blackness is diminished"—That a black surface is a more or less intensely black, according to the manner in which it receives the light, is doubtlessly true; but, many objections present themselves against this theory, if it be offered as explanatory of the cause or origin of that colour which we call black. All the remarks that are here offered might be made upon crimson, or blue, or green velvet, as upon black; and consequently the same conclusion might be drawn, that these colours are owing to the absence of light All the colours, in their most concentrated or intense state, assume the appearance of black: and we do not discover our mistake without dilution or contrast. Very frequently that which seems black is found, on contrast with blue, to be brown, or, on contrast with brown, blue. That colour is allowed to be a real black, which on dilution is a real grey. Now, it is known, that a perfect grey may be produced by the due mixture of yellow, red, and blue; and a concentrated, intense, or deep grey, being a true black, it seems reasonable to found upon these premises, an assertion that black is a colour produced upon the same combining principle that renders blue and red a purple; and to be compounded of yellow, red, and blue in a concentrated state, and in such proportions as to prevent the preponderance of either.

There are many shades or varieties of this colour. The native black substances, are black chalk, pit-coal, black sands, black vegetable juices, and cuttle-fish ink. Those which are the pro-

duct of fire, comprehend charcoal blacks, soot blacks, and black metallic calces.

Blacks obtained by mixture, are those from iron, silver, and from a combination of lead with sulphur. The infusions of certain vegetable astringents, mixed with green vitriol (which is a solution of iron in the sulphuric acid), produce a deep black colour, of most extensive use for dyeing and staining. The astringent substances chiefly employed for this purpose, are the excrescences of the oak-tree, called galls; all parts of this tree, as the leaves, acorns, and more particularly the bark and wood. A great variety of other vegetable substances, such as the small branches, and flowers of the sumach-tree, alder bark, bistort root, and, in general, those which are astringent or corrugating to the taste, possess similar properties. The power by which these vegetables strike black with vitriol, and their astringency, are proportional to one another, and seem to depend on one and the same principle. Of the other properties of this astringent and colouring matter, little more is known, than that it is dissolved and extracted both by water and spirit of wine, and that it does not exhale on the evaporation of the menstruum.—See the article DYEING.

The only native vegetable black, is the juice of the cashew nut-tree, or *Anacardium occidentale*, which probably is the tree that yields the black varnish of China and Japan.—See VARNISH.

Lastly, there are also several colours artificially prepared for the use of painters, such as lamp-black, ivory-black, German-black, &c.—See COLOUR-MAKING.

BLACK BIRD, or *Turdus merula*, a species of the thrush When young, its plumage is of a rusty black; but at the age of one year, being the period of its full growth, its feathers acquire a deep glossy black, the bill a bright yellow, and the edges of the eye-lids a similar colour.

The black-bird loves solitude, and chiefly frequents thickets, and the remotest parts of plantations and woods. In severe winters, however, it is sometimes compelled to approach barns and farm-yards, in search of food. It builds earlier than any other bird, and forms its nest in hedges and thickets, of withered grass and moss, plastered with clay, and covered with hay or straw. Its eggs are commonly four or five in number, of a bluish-green colour, marked with irregular dark spots. About the latter end of March, it has a young brood, which may be taken at ten or twelve days old. The only way to distinguish the young cock from the hen, is by its colour; as that of the former is of a deeper black. When young, they are commonly fed with bread and milk, or curds; but the most proper nourishment is a sheep's heart chopped small, mixed with bread and moistened with water: they should be fed every two hours, and kept very clean.

This bird, especially the male, has a very pleasing note, but too loud for a confined situation; and it may be taught to whistle tunes to a pipe. It sings during the spring, and the early part of summer; is silent in the moulting season, and resumes its music in the latter part of autumn

BLACK-BIRD, (CROW). *Gracula Barita.*

BLACK-BIRD (RED-WINGED).—*Oriolus Phœniceus*

These birds make their appearance in March, and are generally called black-birds, because in the spring season, before the time of incubation, and in autumn, after they have reared their young, they flock together, and confederate in their depredations, on the corn (maize) and grain fields.

BLACK-CATTLE, among graziers, denotes all the larger kinds of domestic animals which contribute to our support or convenience; such as oxen, cows, horses, &c. As these will be respectively treated of in their proper order, we shall, therefore, at present, state only the essential properties of a perfect breed of *black cattle*, designed for the purposes of the dairy, as laid down by Mr MARSHALL:

1. The head small and clean, to lessen the quantity of offal. 2. The neck thin and clean, to lighten the fore-end, as well as to lessen the collar, and make it fit close and easy to the animal in work. 3. The carcass large, the chest deep, and the bosom broad, with the ribs standing out full from the spine; to give strength of frame and constitution, and to allow sufficient room for the intestines within the ribs. 4 The shoulders should be light of bone, and rounded off at the lower point, that the collar may be easy, but broad, to give strength; and well covered with flesh, for the greater ease of draught, as well as to furnish a desired point in fattening cattle. 5 The back ought to be wide and level

throughout; the quarters long; the thighs thin, and standing narrow at the round bone; the udder large when full, but thin and loose when empty, to hold the greater quantity of milk; with large dug-veins to fill it, and long elastic teats for drawing it off with greater ease. 6 The legs (below the knee and hock) straight, and of a middle length; their bones, in general, light and clean from fleshiness, but with the joints and sinews of a moderate size, for the purposes of strength and activity. 7. The flesh ought to be mellow in the state of fleshiness, and firm in the state of fatness. 8. The hide mellow, and of a middle thickness, though, in our author's opinion, this is a point not yet well determined.

Black Cattle, as well as horses, have been observed to thrive better in salt-marshes, than in fresh-water meadows, or upland pastures; and it has been conjectured, that the herbs produced by the lands near the sea, are more healthy for herbaceous animals, than such as grow on higher lands But it is said, that the saline particles with which the earth, as well as its produce near the sea, is strongly impregnated, occasions this beneficial change in the condition of cattle: as these salts purge away the foul humours which the beasts have contracted, either by idleness, or by being over-heated in labour As cattle are naturally fond of salt, and if left at their liberty, will take no more of it than what is conducive to their health, it is recommended to lay common sea-salt in the fields, for them to lick as often as they please See SALT

BLACK CANKER, is the name given by husbandmen to a caterpillar which commits great devastation among turnips The best method of destroying these insects is, to turn a body of ducks into the fields infested by them. In the year 1784, Mr COKE purchased four hundred ducks, and set them at liberty on thirty-three acres of turnips, which they completely cleared of the caterpillar in five days In a relative proportion, twenty or thirty might be employed upon a small farm, with considerable effect.

Black Clock. See BEETLE.

BLACK FLY, an insect that attacks the seedling leaves of turnips, cabbages, and many other vegetables. In summer, it may frequently be seen in swarms on the wing near the ground, searching for, and settling on the fresh bites; and thus, in some seasons, destroying thousands of acres. Its ravages may be prevented by the following means:

Mix one ounce of flour of sulphur, with three pounds of turnip-seed daily, for three days successively, in a glazed earthen pot, and keep it closely covered, stirring it well at each addition, that the seed may be impregnated with the sulphur; then sow it as usual, on an acre of ground, and the fly will not attack it till the third or fourth seedling-leaf is formed, by which time the plant will have acquired a bitterish property, and consequently be out of danger. Others advise to fix alder boughs in a harrow, and draw them over the land immediately after the seed is sown. Again, others bruise the boughs, and fumigate them with burnt tobacco, and a small quantity of asafœtida See TURNIP

BLACK, IVORY—*To prepare genuine Ivory Black*. Both the coal of ivory and of bone are formed into what is called ivory black, by giving them after being soaked in linseed oil a great heat, all access of air to them being previously excluded. This black, when pure, and prepared actually from ivory, is of a full clear black, and would be most useful of any, in all kinds of painting, but that it is apt to dry somewhat too slowly in oil.

BLACK LAND, in agriculture, a term used to denote a peculiar kind of clayey soil, which in rainy weather appears of a dusky or blackish colour, though, when dry, it more resembles a pale grey, than a true black. On ploughing this soil, especially in wet seasons, it is apt to adhere to the plough-shares and assumes a darker and muddier appearance, the more it is worked It generally abounds with small white stones, and always contains a considerable proportion of sand. A soil of this description may be improved, by manuring it with such substances as tend to pulverise the ground, and deprive it of its tenacity. See LAND and MANURE.

BLACK LEAD, otherwise called plumbago and graphites. A mineral substance used in the making of pencils, in forming a composition for crucibles, and in covering the surface of iron utensils to preserve them from rust and give them a good appearance It has a dark iron-black colour, a metallic lustre, and a thin slaty fracture: it is found in separate loose pieces of a fine grain which are very soft, and leave, as is well known, strongly-coloured traces on paper by friction. Its speci-

fic gravity varies from 1·9 to 2·2. "It suffers no change even by the most violent heat, if exposed to it in closed vessels, neither does it melt, but if it be roasted with a strong and continued heat, and air be admitted, the greatest part of it disappears, leaving behind a small portion of oxide of iron." This substance was formerly thought to contain lead, as two of its names obviously indicate, but it is now discovered by analysis to be a compound of carbon and iron, in the proportion of about nine parts of the former to one of the latter; and therefore in modern chemical language it has received the more appropriate name of CARBURET OF IRON.

[Black lead is found in Scotland, in Morris county, New Jersey, in New York State and of excellent quality in the primitive soil, 9 miles from Philadelphia, in Oxford township on the Frankford road.—T C.]

BLACK LEATHER is that which, having passed through the hands of the currier, after being scored and rubbed three times on the grain side with copperas-water, acquires a black colour, instead of the russet, as left by the tanners See LEATHER.

BLACK-LEGS, a name given by the Leicestershire breeders to a disease incident to calves and sheep. It is a kind of gelatinous humour, which settles between the skin and flesh of the neck, and not unfrequently in their legs. To remove this troublesome complaint, we conceive that the sal ammoniac dissolved in the smallest possible quantity of water, and applied to the parts affected, by means of proper compresses, or even simple friction, conjoined with suitable exercise, would be the most effectual remedy.

BLACK TIN, in mineralogy, a term given to tin ore when it is ready to be melted into metal, after having been well stamped, washed and dressed. It is taken up from the washing troughs in the form of a fine black powder, and from this circumstance is called *black tin;* two pounds of which being melted, will produce one pound of *white tin.* The principal mines from which this useful metal is obtained in Britain, are those in Cornwall. See TIN.

BLACK WADD, in mineralogy is a kind of ore of manganese, remarkable for its property of taking fire, when mixed with a certain proportion of linseed-oil It is found in Derbyshire, and is a useful ingredient in paints; for on being ground with a large quantity of oily matter, it loses the property above mentioned. [Black lead is also known by the miners as black wadd.—T C.]

BLACKBERRY, the fruit of the common bramble, or *Rubus fruticosus,* L. See BRAMBLE.

These berries, when eaten immoderately, and too frequently, are apt to produce the most violent effects, as fever, delirium, &c.

BLACKBERRY. *Rubus Americanus.* We have two distinct species, the fruit of which, in general is called blackberries. The first which we designate by the above title, is a robust plant, which frequently, in a rich, moist, loose soil, will send forth shoots 10 or 12 feet in length, and an inch in diameter, somewhat ribbed or angled, armed with strong hooked spines; the next season after these shoots spring out of the earth, they flower, and bear fruit in corymbs or clusters, which terminate like the branches, proceeding from the axils of the leaves; the fruit is oblong, above an inch in length, ¾ of an inch in diameter, of a beautiful shining black colour, and of an agreeable taste, sweetish mixed with a sub acid astringency.

The second species we shall notice, *Rubus procumbens,* (*Rubus hispidis* of MARSHALL,) is commonly known by the name of *Dewberry.* This brier does not grow either so high or so robust as the preceding species; its stems are weaker, diverge from the root, and bear down towards the earth; their extremities often trail on the ground, and taking root in the earth, form new plants, and in a little time spread over uncultivated fields. This species prefers high hilly land; the fruit is large, nearly round, and black when ripe, suffused with a glaucous nibula, or mist, like the Damacene plum, grapes, &c. They possess a sweet and lively subacid taste, and for eating is generally preferred to the former species.

Rubus occidentalis. See RASBERRY.

BLACKING, in general signifies a factitious black; as lamp-black, shoe-black, &c. The common oil-blacking, consists of ivory-black mixed with linseed-oil. The shining blacking is made in various ways, and affords employment to several persons in London, who prepare it for the supply of the shops. The preparation which has experienced the most extensive sale, is probably that of Mr. BAYLEY. His patent being expired, we shall communicate the particulars of the process Take one part of the gummy juice that

issues in the months of June, July and August, from the shrub called the *goat's thorn*; four parts of river water; two parts of neat's foot, or some other soft, lubricating oil; two parts of superfine ivory-black; two parts of deep blue, prepared from iron and copper: and four parts of brown sugar-candy. Let the water be evaporated, and, when the composition is of a proper consistence let it be formed into cakes, of such size that each cake may make a pint of liquid blacking.

Another Recipe for Blacking.—Two ounces ivory black; one tea spoonful of oil of vitriol; one table spoonful of sweet oil; and two ounces brown sugar; roll the same into a ball, and to dissolve it add half a pint of vinegar and water.

Another.—Take one part of gum tragacanth, four parts of river water, two parts of neat's-foot, or some other softening, lubricating oil, three parts frankfort or ivory black, four parts brown sugar-candy; boil the mixture, and when the composition is of a proper consistence, let it be formed into cakes of such a size that each cake may make a pint of blacking

[As good blacking as any may be made by mixing lampblack with a little sugar and the white of an egg: then dilute with stale beer —T. C]

Frankfort-blacking is made by the following simple process. A quantity of the lees of wine is burnt in a well-closed vessel, and the residuum reduced to powder, which when mixed with water, is fit for immediate use; or, if made into cakes, may be preserved for any length of time

Ivory-black, as imported from Holland, is prepared in the following manner: Small pieces of ivory are smeared with a little linseed oil, and put into a black-lead crucible; this is covered with a similar vessel inverted, but of a smaller size, and the crevices are secured with a lute made of potter's clay and rye-flour, so as to prevent the access of external air. Thus prepared, the whole is exposed to a red heat, not too intense, for about half an hour, after which it is taken out and suffered to cool gradually. When cold, the charred ivory, or bones, where the former is scarce, ought to be reduced to powder, and triturated, with the addition of water, on a painter's stone, till it assumes the form of a smooth paste. In this state, it is moulded into small cones, and allowed to dry. Similar black may also be obtained by burning the stones of peaches, after having previously dried them and removed the kernels. This useful fact we state on the authority of HOCHHEIMER, a German writer on general economy.

BLADDER, in anatomy, a thin membranous, expanded receptacle of some juice or humour secreted in the animal body. This term principally applies to the vessels in which the urine and bile are respectively collected; and hence the two chief reservoirs of this nature are the *urinary bladder*, and that containing the *bile*. In this place we shall treat only of the former, which is situated within the cavity of the pelvis: its form is oval, and being a continuation of the abdomen, it is almost uniformly surrounded with bones, though below, and at each side, encompassed by muscles. It is remarkable, that this vessel is considerably larger in the female than in the male sex.

Nature has wisely contrived that the human bladder should possess a high degree of expansion, for containing the watery parts secreted from the chyle, as they would otherwise mix with the blood of animals, and render that fluid too thin for the performance of its functions. Though a large proportion of such aqueous humours, from three to four pounds every day, are insensibly evacuated by the skin, yet a still greater quantity must be secreted by the kidneys, and thence conducted to the bladder, lest they should accumulate between the interstices of the cellular membrane, which covers all the muscles, and occasion dropsical swellings On the other hand, the diseases incident to the bladder are various, but principally arise from debility, spasms, and calculous concretions; for an account of which, we refer to the articles GRAVEL, STONE, and URINE. At present, we shall confine ourselves to the inflammatory state of that vessel, which requires immediate relief. This dangerous malady is occasioned by stimulating medicines; gravel and stones lodged in the orifice of the bladder; violent exercise after a long retention of urine, and especially in hot weather; lying in soft, effeminating feather-beds, &c. The symptoms are manifest from an acute burning pain, and tension of the part, frequent inclination to go to stool, and a constant desire to make water, while the patient is in a state of fever. As under such circumstances, no time should be lost in applying for proper advice, it would be needless to enlarge on the treatment of the disease; but we shall observe that, beside

bleeding and purgatives both by the mouth and injections, it will be necessary to drink plentifully of emollient decoctions, or other beverages of a cooling and diuretic nature. Previous to the arrival of a medical man, leeches may be applied to the part affected; the lower belly should be diligently fomented with warm water, and the patient be placed in a tepid bath, not exceeding 88° If, however, the pain suddenly abates, and is succeeded by cold sweats, hiccough, fetid urine, or a total suppression of it, there is reason to apprehend a mortification, and fatal issue of the disease.

The want of fulness and tension in the pulse in this disease, must not be attended to. We must be guided by the continuance of the symptoms. Bleeding should be repeated every three or four hours, and half a pint taken away at a time. No disease requires or bears more copious bleeding. Clysters of cool water ought also to be injected

BLAIN, in farriery, a distemper incident to horses and cattle, consisting of a tumour which grows on the root of the tongue, and swells to such a size as frequently to stop respiration. It is caused by excessive irritation and heat of the stomach, and discovers itself by the animal's gaping, and hanging out its tongue. The method of cure is as follows: Lay the beast on the ground, open the tumour, and wash it with vinegar and a little salt.

BLANCHING, the art or manner of rendering any thing white. See ETIOLATION.

The blanching of woollen stuffs is performed with soap, chalk, sulphur, &c. Silk is blanched with soap and sulphur, and wax is rendered white by exposing it to the action of the sun and dew. [Almonds and nuts are blanched by putting them in boiling water, which loosens the skin —T. C.]

BLANC-MONT, a stupendous mountain in Savoy, the highest of the Alps, and encompassed by those wonderful connexions of snow and ice called the Glaciers. Of these glaciers there are five, which extend almost to the plain of the vale of Chamouni, and are separated by wild forests, corn-fields, and rich meadows, so that immense tracts of ice are blended with the highest cultivation, and perpetually succeed to each other in the most singular and striking vicissitude. All these several valleys of ice, which lie chiefly in the hollows of the mountains, and are some leagues in length, unite together at the foot of Mont-Blanc; the highest mountain in Europe, and probably of the ancient world. It was reckoned that the summit of this mountain was inaccessible, before Dr PACCARD, a physician at Chamouni, attempted to reach it in August 1786, and succeeded in the attempt. Soon after, the same undertaking was resolved upon and accomplished by M. DE SAUSSURE, who published a narrative of the journey

This excellent naturalist states that the summit of the mountain is a ridge nearly horizontal, lying east and west; the slope at each extremity is inclined from 28 to 30 degrees, the south side between 15 and 20, and the north about 45 or 50. This ridge is so narrow as scarcely to allow two people to walk abreast, especially at the west end, where it resembles the roof of a house. It is wholly covered with snow; nor is any bare rock to be seen within 150 yards of the top. The surface of the snow is scaly, and in some places covered with an icy crust, under which the snow is dusty and without consistence. The highest rocks are all granites; those on the east side are mixed with steatites; those on the south and the west contain a large quantity of schorl, and a little lapis corneus. Some of them, especially those on the east, which are about 150 yards below the summit, seem to have been lately shivered with lightning.

M. DE SAUSSURE saw no living animal on the mountain except two butterflies, which he supposes must have been driven thither by the wind. Lichens are the only vegetables which are found on the more elevated parts of these mountains: the silene acaulis, which grows in great quantities on the lower parts, disappears at the height of about two miles above the level of the sea.

BLANKET, an article of commerce so well known in domestic economy, that any definition of it would be superfluous.

Blankets are made of felt-wool, or that from sheep-skins, which is divided into several sorts Of the head-wool and bay-wool, they make blankets of ten, eleven and twelve quarters broad; of the ordinary sort, those of seven and eight quarters; and of the best tail-wool, are made blankets of six quarters broad, commonly called cuts, and used for seamen's hammocks. See HYKES.

BLAST, in agriculture and gardening, is a term synonymous with *blight*, which see.

That species of blasts called *uredines* or *fire-blasts*, is supposed by Mr HALES to originate from the solar rays, reflected from, or condensed in the clouds, or collected by the steams in hop-gardens, &c. They wither, scorch, and blacken the leaves, blossoms, and fruits of trees, shrubs, grass, corn, &c. and this devastation is at times extended over whole tracts of ground.

BLASTING, among miners, a term for the tearing up rocks, which they find in their way, by gun-powder. The method of doing it is this: they make a long hole like the hollow of a large gun-barrel in the rock they would split; this they fill with gun-powder: then they firmly stop up the mouth of the hole with clay, except a touch-hole, at which they leave a match to fire it.

BLASTING OF WOOD, the rending in pieces logs of wood, such as roots of trees, &c. by means of gun-powder.

A method has been lately described by Mr Knight, which is simple and easily effected. The instrument used is a screw, with a small hole drilled through its centre. The head of the screw is formed into two strong horns, for the more ready admission of the lever with which it is to be turned, and a wire for the purpose of occasionally clearing the touch-hole When a block of wood is to be broken, a hole is to be bored with an auger to a proper depth, and a charge of gun-powder introduced. The screw is to be turned into the hole till it nearly touches the powder; a quick match is then to be put down the touch-hole till it reaches the charge. The quick match is eighteen inches long, to afford the operator an opportunity of retiring, after lighting it, to a place of safety: it is made by steeping a roll of twine or linen thread in a solution of salt-petre

BLEACHING, is the art of whitening linen, cloth, thread, cotton, &c. In the present advanced state of the linen and cotton manufactures of Great Britain and Ireland, the art of bleaching is one of the most interesting and important. Its object is to reduce *flax, cotton,* or the *threads* or *cloths* manufactured from them, to a state of perfect whiteness. To attain this end, oils, metallic oxides, earthy impregnations, resins, and other animal, vegetable, or mineral particles, containing any colouring matter, must be discharged from the texture of the substances manufactured.

The old process of bleaching linen, was divided into five parts; viz. 1. Steeping and milling; 2. Bucking and boiling; 3. Alternate watering and drying; 4 Souring; and 5. Rubbing with soap and warm water, starching and blueing By the first of these methods, the cloth is in a great degree freed from its superficial foulness, and is rendered more pliant and soft. The second process is the most important of the whole. Its object is to loosen and carry off, by means of alkaline leys, that particular substance in cloth, which is the cause of its brown colour, the operation of alternate watering and drying is as follows: After the cloth has been bucked, it is carried out to the field, and frequently watered, during the first six hours For, if in the course of that time it be allowed to dry, while strongly impregnated with salts, the latter, by approaching closer together, and being assisted by a degree of heat which increases in proportion to the dryness of the cloth, act with greater force, and destroy its texture. After this time, dry spots are suffered to appear before it receives any water.

By the continual evaporation which takes place on the surface of the cloth, it is evident that this operation is intended to carry off some impurities that remain after the former process of bucking. This is clearly proved from the fact, that the upper side of the cloth, where the evaporation is strongest, attains to a greater degree of whiteness than the reverse side; and the whole likewise turns much lighter on being exposed to the influence of the sun, air, and winds.

After the cloth has been sufficiently soured, it is washed in the mill, to deprive it of the acrid particles which adhere to its surface. From the mill, it is taken to be washed with soap and warm water, to free it from the oily particles which could not be disengaged by the milling Soft soap is preferred to hard, for this purpose, as the latter contains a considerable quantity of sea-salt, which is prejudicial to the cloth.

The management of coarse cloth in this operation is very different from that of fine: for the former, instead of being worked by the hands, (a method which would be too expensive) is laid upon a table, rubbed over with soap, and then placed between what are called rubbing-boards, which have ridges and grooves from one side to the other, in the form of teeth.

The starching and blueing, which is the last operation, differs so little

from the process employed by laundry-women, that it scarcely requires description. But it often happens, that the cloth, when exposed to dry in the open air, after being starched, is wetted by rain, which frustrates the effects intended by the operation: to remedy this inconvenience, many bleachers employ a dry-house, where the linen may be dried in all weathers.

As bleaching is a process still susceptible of improvement, scarcely a year elapses, which does not produce some new discovery in this useful branch of manufactures. We shall, therefore, content ourselves with communicating a few of such hints as may prove advantageous to the practical bleacher; and with which, we presume, there are many persons still unacquainted.

The new method of bleaching with the dephlogisticated or oxygenated muriatic acid, or spirit of salt combined with ogygen, is founded upon the remarkable property which that acid possesses of destroying vegetable colours. This acid was first applied to the purpose of bleaching by M. BERTHOLLET; and the particulars of the process are described at length in a treatise on bleaching published a few years since, at Edinburgh.

It is to be regretted, that no exact comparative statement of the difference of expense between the old and new methods of bleaching, has yet been laid before the public; but it is probable that the acid drawn from one pound of salt, will whiten four of linen cloth, without any addition. The expense in this case may appear trifling, but when we compute the vitriolic acid which is employed, and that the residuum is almost useless, it will soon be found to be very considerable; and, upon the whole, the advantage may be only in the saving of time: but M. BERTHOLLET asserts, that by this method the texture of the cloth is less injured than by that hitherto practised.

The oxymuriatic acid is also very enerally used for bleaching paper. According to M CHAPTAL, blotting-paper, when put into it, is bleached without suffering any injury: and old books, and prints, when soiled in such a manner as to be scarcely distinguishable, have been completely restored to their original state. The simple immersion of a print in this acid, is sufficient to produce that desirable effect; but with books some farther precaution is necessary: they should be unsewed, and the adhering leaves carefully separated, that the whole may be equally impregnated.

It has been discovered that the oxymuriate of lime is, in bleaching, not only cheaper, but in other respects preferable to that of pot-ash. The chemical attraction of the former is somewhat stronger than that of the latter; and, on account of this quality, it does less injury to the cloth. Alternate boilings in solutions of pot-ash, steepings in oxy-muriate of lime, exposure to the action of light, and evaporating water on the green, are found to complete within six weeks, at little more than half the expense, what otherwise cannot be performed in less than double the time. [The oxymuriate of lime dissolved in water, forms the *eau de javelle*, so generally used by the laundresses of France.—T C.]

Mr. HIGGINS was led to conjecture, that lime, which, in other respects, possesses properties nearly similar to those of the fixed alkali, might also resemble them in the detergent effect of their combination with sulphur. He made trial: a sulphuret of lime, composed of four pounds of sulphur added to twenty pounds of lime, and diluted in sixteen gallons of water, formed a solution which answered cold, just as well for the bleaching of linen, as the boiling solution of pot-ash. In consequence of this experiment, he recommends, that linen, after being perfectly cleansed from the weaver's dressing, be immersed *alternately* in solutions of sulphuret of lime, and of oxy-muriate of lime, namely *six times* in each [But this method is not much used —T. C.]

The following process was communicated for the first American edition of this work, by Dr. COOPER, its present editor, who says, it was the result of the successful experience of 3 years in England, where it is still a secret, as to the oxymuriatic acid as made from red lead.

Bleaching Linen. In bleaching linen, the objects are as follow: To get rid of the sowen or paste used by the weaver; to destroy the colouring matter of the cloth; to give additional whiteness when this is destroyed; and to give apparent fineness to the cloth.

Into a tub sunk in the ground, put any number of pieces from 50 to 100 immersed in water. Let them stay therein for two or three days, until there is an appearance of fermentation. Take them out and dash them well in the dash-wheel, and lay them down on

the grass till dry. Into a cuir or round tub, about four feet six inches deep, capable of holding 220 pieces of common Irish linen, put in that quantity. The upper pieces should be covered by pieces twisted and placed very close, so that the steam may be somewhat confined, near the bottom of this cuir is a hole, stopped occasionally with a plug through which the liquor is let out into an iron pan just below. Under this pan is a fire, with its proper flue. Put into this iron pan 70lb of good pot-ash. It is absurd to use kelp or barilla: it is more impure, much weaker when pure, and in all respects dearer and less efficacious, than the vegetable alkali. Fill the pan with water, and make a fire under it. The pan should hold just enough to let the liquor cover the cloth when the cuir is full and the plug in.

By the side of the pan stands a man with a tin vessel, holding about a gallon, fixed at the end of a wooden handle; with which he continually lades out the liquor in the pan to the cloth, distributing it evenly, beginning with it cold, and continuing as it boils from morning to night, occasionally filling up the pan to prevent the alkaline solution being too strong. This operation, which should continue nine hours, is called *bouking*. The cloth is thus left all night, taken out in the morning, well dashed and laid down on the grass for about a week, being turned every day or two. It must undergo this operation of *bouking* a second time, with from 50 to 60lb. of pot-ash, and being well dashed, is laid down as before. It is now soured in vitriolic acid and water, in tubs sunk in the ground: the mixture should be the strength of *strong* vinegar or a little more. In this souring they should continue two days and nights at least: then dashed well; layed down for a week and turned as before. The pieces should then be *bouked* with 30lb. of pearl ash, and ten pounds of soap to a cuir; dashed, laid down for three or four days: then soured, dashed, laid down for three or four days, turned, &c as before.

Bouk again with 25lb. of good pearl-ash to a cuir. Dash, lay down for two or three days, and then sour if you please in the oxygenated muriatic acid, made in the manner directed in the article MURIATIC ACID. If you do not use the oxygenated acid, sour again in common vitriolic acid for six or eight hours, and wash it extremely well. *Indeed, perfect dashing continued to a certainty of all the acid being washed out, is indispensible:* otherwise the pieces would rot on the ground when dry.

Less than a month is not sufficient to get a piece of linen cloth perfectly white, though half that time will do for calicoes in England: but in America the superior heat of the sun will save at least one fourth of the time in laying down the pieces. After this process, the cloth in Ireland is put under the operation of the rubbing boards, which certainly injure the texture, as appears by the knap on the teeth, although the more soap is used the less injury is done. But it is a part of the manufacture which may be omitted where the cloth is required to gain credit by the strength of its texture.

After the rubbing boards the cloth is gradually wound round cylinders of wood and beetled. The beetles are stampers lifted up by a cog-wheel, and let fall on the cloth, as it is slowly taken up round a turning cylinder. This is also a part of the operation by which the thread is flattened, and the cloth made to look finer at the expense of the texture.

It is then run through a very thin solution of fine starch, and blued with smalt. Then run through two cylinders to give it evenness and gloss, and made up for market.

Bleaching of Cotton.—The process is exactly the same as for linen, only requiring less time and labour, viz.

1. Steep the grey cloth for two or three days, then wash.

2. Bouk with 70lb of pot-ash to 230 pieces of callicoe of 28½ yards each, or muslinets, velverets, &c. in proportion, that is to a cuir (*keer*) full, which will hold 230 calicoes in the grey. A cuir that will hold 230 calicoes will not hold quite so many of Irish linen of equal length.

3. Lay the goods down on the grass three days, turning them each day.

4. Bouk with 50lb. of good pearl ash, and about 5lb. of soap. Dash, lay down for three days as before.

5. Sour in vitriolic acid and water, the strength of *strong* vinegar for two days.

6. Dash well, lay down for three days as before.

7. Bouk with 30lb. of pearl ash, dash and lay down for three days.*

8. Bleach with oxygenated muriatic acid. Dash well, lay down for a day, dash again and make up the calicoes.

The oxygenated muriatic acid, was discovered by SCHEELE; its application

to bleaching was first suggested by BERTHOLLET and CHAPTAL in France, and used at Glasgow, by Mr WATT, and in Manchester in the year 1791 in a large way, first by BAKER and Co. whose process has never yet been made public, and is that now about to be detailed.

The method of making this acid for bleaching, yet used in Manchester and elsewhere, is by adding to 3 parts, by weight, of manganese, 8 parts of common salt, and 6 parts of oil of vitriol, and 12 of water. These are distilled together, and the products received in barrels of water, arranged in the manner of WOLFE's apparatus by tubes communicating from the retort to the first barrel, and from the first to a second. Sometimes the water is only impregnated with the acid, sometimes it is made to saturate lime or pearl ash. This process cannot be used with economy, the trouble and expense of retorts, and the attendance on the fire renders it complicated so as ultimately to bring it into disuse. It has not yet, and never will answer for goods in general. Where particular patterns are suddenly wanted for the market it may pay.

The writer of this article (T C) attended for three years continually to the bleaching of cotton goods of various kinds, to the amount of 800 pieces of calico per week, on the average of the year, by the following process. The goods underwent three bouckings, as described before in this article, and two acid baths. The third was the oxygenated muriatic acid made as follows. In a building of one room on a bank and another over it, were placed on substantial frames or tressels, five wooden cylindrical machines four feet diameter by five feet long, the staves two and an half inches thick and well dove-tailed. Into each of these, twice a-day, through a funnel inserted in a two-inch auger hole, and let through the floor of the upper room, was poured 75lb of salt 125lb of red lead. To this was added b. of oil of vitriol, weighing 29½ oz. to the wine pint.

The machine was then filled with water, the auger hole stopt with a plug and rag, and then turned round 20 or 30 times, and in 15 minutes the acid was made. The vitriolic acid acts on the salt, and the marine acid thus produced on the red lead, which in a few minutes is deprived of its oxygen, and converted into vitriol of lead. The handle of each machine was fixed on the centre of one of the ends with two cross-bars, thus, ×. The acid when made was let off on the pieces placed in covered wooden vessels in a room adjoining and below. One of these vessels full, was allowed to 60 muslinets. No lead remained in the liquor, for vitriol of lead is insoluble.

This process may be imitated in a small way, by pouring into a *strong* vial, with a glass stopper, about an ounce of spirits of salt on a tea-spoonful of red lead; stop the vial, heat is generated, the lead turns white, and a very strong oxygenated acid is produced in a minute's time. But this acid will contain a little lead, while the acid made with vitriol and salt does not. This acid has lately been recommended by GUYTON MORVEAU, as an effectual destroyer of putrid exhalation.

[The common method of preparing the bleaching liquor, is by mixing lime in a large wooden vessel with water, and sending in the vapour of chlorine gas till the lime is dissolved. But without the repeated previous application of alkaline and acid liquors, no good white can be obtained. The bleaching liquor will not bleach alone —T. C.]

Muslinets and muslins require a detail of processes *after* they are white, too long and complicated to be described in this compendium.

[See a practical memoir on this subject, in the 1st. vol. of the Trans of the Am. Phil. Society, new series, 1818. This memoir comprehends all the late improvements —T C]

BLEAK, *Cyprinus Alburnus*, is a small fish of the carp tribe, with somewhat pointed muzzle; and no beards; and the scales thin, shining, and slightly attached

It seldom exceeds the length of five or six inches.

These fish are found in shoals in fresh water rivers, in nearly all the temperate parts of Europe, and are extremely common in many of those of our own country.

There is in Paris a great consumption of these fish on account of their *scales*, which are used in the manufacture of *artificial pearls*. The scales are scraped off into clear water, and beaten to an extremely fine pulp. After this the water is several times changed until they are entirely free from colour. The silvery matter that is left precipitates to the bottom; and the water is carefully poured off from it by inclining the vessel. This substance, mixed with a little size, is introduced in small quantity into thin glass bubbles by a slender

pipe, and moved about until their whole interior surface is covered. The remaining part of the bubble is then generally filled with wax. The inventor of this art was a Frenchman of the name of JANNIN, a bead merchant in Paris.

In some countries bleaks are pickled in the manner of anchovies. When of large size they are well flavoured, but are too bony to be in much request as food even by the poor. They are considered in greatest perfection in the autumn.

BLEEDING, a term used to express either a spontaneous or artificial discharge of blood: in the former case, it is by medical writers called *hemorrhage;* in the latter, *venesection*, or blood-letting, of which last we propose to treat in its place. At present, therefore, we shall consider only those evacuations which Nature directs to take place in the system, and frequently for the benefit of the individual.

1. *Bleeding at the nose* generally arises in full, sanguine habits, more commonly in young men than women, especially during adolescence. Exposure to the heat of the sun, a hot room, contusions of the head, or acrid substances introduced into the nostrils, are the general causes of this complaint. On its first attack, all cumbersome clothes and ligatures, especially those about the wrists and neck, ought to be instantly loosened; the patient should be removed to a cooler temperature, and placed in an erect posture; his hands and legs immersed in tepid water, about milk-warm; and dossils of lint dipped in vinegar, or a strong solution of white vitriol, put up the nostrils. In general, bleeding at the nose may be stopped by screwing up the nostril, a piece of dry linen rag, rolled very tight. Sometimes it answers to dip the plug in a weak solution of sugar of lead in vinegar. If the bleeding does not abate, or threatens to become more profuse, cold water, or solutions of nitre and sugar of lead, should be repeatedly applied to the forehead and temples, as well as the region of the kidneys and genitals.—One of the most effectual methods of stopping violent bleeding, consists in the unremitted administration of lukewarm, emollient clysters, in such small proportions as may be retained and absorbed by the bowels, while cold fomentations are applied to the abdomen. Meanwhile, the patient should drink lemonade, or water acidulated with a few drops of vitriolic acid, and sweetened with sugar; or if these cannot be had, a mixture of equal parts of vinegar and water may be substituted: [but for the most part these hemorrhages are salutary efforts of nature to relieve herself from over fulness of the blood vessels, and ought not to be stopped unless very profuse.—T. C.]

2. *Spitting of blood* may be owing to an abundance of that fluid, an organic debility of the lungs, or an imperfect structure of the chest. It may also proceed from exertions in blowing wind-instruments, loud speaking, singing, running, wrestling, and excess in drinking, especially after violent exercise. This alarming complaint is attended with a dry cough, and difficulty of breathing: and if the evacuated blood be thin, frothy, and florid, it indicates a rupture of some pulmonary artery; but if it be thick, and of a darkish colour, while the coughing up is accompanied with pain, the disease is then occasioned by a fall, or other external injury. In either case the diet should be cooling and diluent: hence sweet whey, a decoction of marsh-mallows, or barley, vegetables abounding in mucilage, the mildest laxatives, consisting of manna, tamarinds, phosphorated soda, vitriolated tartar, &c. ought to be instantly resorted to. At the same time, emollient clysters, bathing the legs in tepid water, and a suspension of all mental and bodily exertion, are absolutely necessary. Bleeding, cupping, styptic tinctures, fox glove, and opium, must be submitted to the discretion of the medical practitioner: and we shall here only observe, that a table-spoonful of fine salt taken dry, has frequently afforded instant relief.

[BLENDE *Sulphuret of Zinc:* found in Pennsylvania, at Perkiomen, and at Webb's lead mine, on the N. E. branch of the Susquehanna, between Danville and Berwick. It has lately been found, that it can be roasted, converted into an oxyde, and used either to procure metallic zinc, or to make brass.—T. C.]

BLIGHT, in husbandry, is a disease incident to plants, and affecting them in various degrees; sometimes destroying only the leaves and blossoms, and frequently causing the whole plant to perish.

Blights are generally supposed to be produced by easterly winds, which convey multitudes of the eggs of insects from some distant quarter; and these

being lodged on the surface of the leaves and flowers of fruit trees cause them to shrivel and decay.

It is the general opinion, that one principal reason why the environs of London are particularly subject to blights, is the great number of pruned trees and cut hedges near that metropolis; for as all vegetables become more or less sickly when the course of their sap is impeded, the trees in this state are more liable to blight, than such as are vigorous and uninjured by the pruning-knife. It is worthy of remark, that to the westward of London the effects of this distemper insensibly decrease, insomuch, that at forty miles distance it rarely occurs, and at an hundred miles and upwards, it is entirely unknown This circumstance seems to favour the idea of its being conveyed by easterly winds. But the true cause appears to be, the continuance of these winds for several days, without the intervention of showers or dews, by which the expansion of the tender blossom is checked, so that the young leaves necessarily wither.

To cure this distemper, some persons burn a quantity of wet litter on the windward side of the plants, as it is supposed that the smoke will suffocate the insects: others fumigate the trees, by strewing sulphur upon lighted charcoal, or by sprinkling them with tobacco-dust, or with water in which tobacco-stalks have been infused for twelve hours. Ground pepper, scattered over the blossoms, has sometimes proved beneficial.

Mr Gullet, of Tavistock, is of opinion that great benefit may be derived from whipping the branches of fruit-trees, with a bunch of elder-twigs, the leaves of which should be previously bruised. The smell of the elder being extremely disagreeable, no insects will settle on the parts touched by it; and some blighted shoots have even been [illegible]red, by first whipping them, and then tying up a bunch of elder leaves among them.

A composition of oil and sulphur, mixed to the consistence of paint, will also prove highly advantageous, in expelling young insects from the trees infested by them.

But the most effectual remedy is, to wash the plants gently and frequently with pure water, and if the young shoots be much infected, to rub them gently with a woollen cloth, in order to clear away the glutinous matter. This operation should be performed in the morning, that the moisture may be exhaled before night.

It deserves to be mentioned, that the blights most destructive to fruit-trees, are those produced by the hoar frosts in spring mornings, which are often succeeded by warm sun-shine.

We shall now give an account of the different remedies that have been proposed by Mr. Forsyth, both for its prevention and cure, according to the various causes from which it may originate.

Where the blight arises from long-continued easterly winds, the diseased tree ought to be washed with a mixture of urine and soap suds: this operation must be performed as early as possible; for the malady may thus be in a great measure prevented; but, if the young and tender shoots be greatly infected, it will be advisable to cleanse them with a woollen cloth, dipped in the following liquor: Take 1 lb of tobacco, 2 lbs. of sulphur, 1 peck of unslacked lime, and about 1 lb. of elder buds: let ten gallons of boiling water be poured on these ingredients into a hogshead, which must now be closely covered, and the whole be suffered to become cool The vessel is then to be filled up with cold water; and, after standing two or three days, during which time the liquor must be skimmed, the mixture will be fit for use

Another cause of blight in the spring, is the sharp hoar frost, which often takes place during the night, and is succeeded by hot days; so that the blossoms and fruit inevitably perish. The only preventive of such accidents, hitherto known, is the covering of walls with old fish-nets, doubled three times; and, if a few branches of dry fern be placed between the boughs, they will greatly contribute to break the force of high winds, as well as of the frost Such shelter ought to be employed only during the night, and be removed in the day time. Thus, the fruit will be effectually preserved; and, as the apparent trouble attending this practice might deter many persons from adopting it, Mr. F. is of opinion, that the object may be easily and expeditiously attained, by contriving to draw up and let down the nets by means of pullies.

Frequently, however, the affection termed *blight*, is merely a weakness in the trees, which depends on the difference of their constitutions, and proceeds from want of proper nourishment; some bad quality in the soil; or from a

distemper in the stock, buds, or scyons; all of which causes produce a malady in trees, that is with difficulty cured.

Should the cause arise from the soil, Mr. F directs it to be dug out, and supplied with fresh mould; or, it will be advisable to remove the trees, and to plant others, which are better adapted to the ground; because it is indispensibly necessary to suit different kinds of fruit-trees, as nearly as possible, to the nature of the land. But, where the weakness of trees is induced by some inbred disease, they ought to be dug up; the earth be changed, and other plants be substituted.

Lastly, there is another species of blight that is very destructive to orchards and plantations, in the months of April and May: it is known under the name of Blast. This malady is conjectured to originate from certain transparent floating vapours, which assume such forms as to converge the rays of the sun, in a manner similar to a burning-glass, and to scorch those plants on which they happen to descend, in a greater or less degree, according to their convergency. The blast occurs most frequently in close plantations, where the exhalation of vapours from the earth, and the perspiration of the trees are confined, for want of a sufficient circulation of the air to disperse them. Mr Forsyth, therefore, recommends a clear, healthy spot, to be selected for kitchen-gardens, orchards, &c.; the trees being planted at such a distance as to give free admission to the air; so that all noxious vapours may be dissipated, before they are formed into volumes capable of occasioning blasts.

Dr. Anderson attributes blights to an insect, and not to east winds He thinks this opinion is proved by the well-known fact, that when the blight once affects a tree to a considerable degree, it is ten to one, but it will be affected with the same disease for many successive years: because, the insects lay their eggs in the bark of the tree, and thus insure their successors. Dr A directs the trees to be brushed early in the spring, in the direction of the buds; or, when the insects are numerous, to cut out the twigs: this operation, though it may diminish the fruit for a year, will put the tree in the finest order the next year. The twigs cut off must be burnt If no attention has been paid to the trees until the leaves appear, they must be pulled off, and the twigs brushed: the tree will put forth new leaves.

In a paper by the late Mr. Curtis, in the 6th vol of the *Lin Society's Transactions, London*, the sentiments of Dr Anderson respecting the cause of blights, are confirmed Mr. C. ascribes this disease to *aphides* They greatly multiply in consequence of a mild winter, but are usually kept in check by *coccinella ichneumon aphidum*, and *musca aphidora*, their declared enemies. In the years 1793, and 1798, they greatly injured the hops in England. They resist immersion in water for hours together, but quickly perish in the smoke of tobacco. They part with an excrementitious saccharine matter, which forms *honey dew*, and gives the sooty appearance commonly called blight.

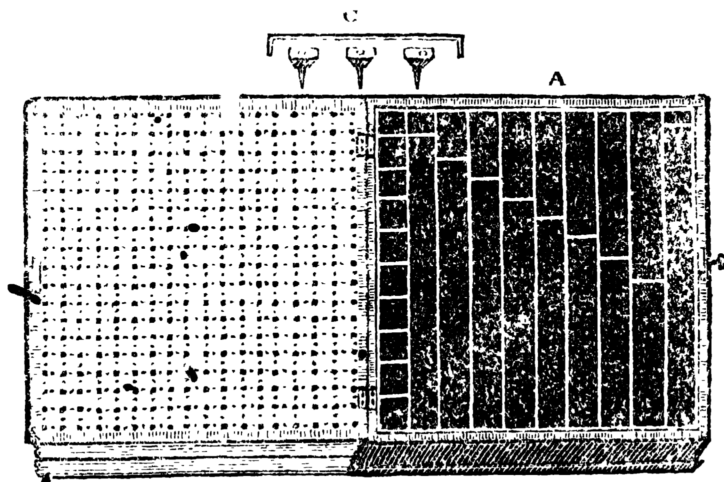
Fruit trees, particularly apple and pear trees, are very subject to the blight or blast, the cause of which is little understood. By accident, Mr. Cooper of New-Jersey, discovered some years since, that a tree upon which a number of iron hoops and other articles of iron had been hung, remained free, while all the rest suffered severely Since that year, he has constantly encircled two or three branches of every tree with an iron hoop, and with uniform success. As a proof, he pointed out one tree with a withered limb near the top, and observed that he had neglected to defend it last year. Philosopers may speculate as to the theory of the operation of the iron, and cause of the blast, but practical men will be contented with a knowledge of the important fact, which comes from a man of judgment, and of an observing disposition, who has again and again satisfied himself that no deception or accidental circumstance occurred, by reference to which, the preservation of his hooped trees could be accounted for.

Blighted corn. See Smut.

BLINDNESS, implies either a partial or total privation of sight, proceeding from some defect of the organs of vision, or an impaired state of their functions. Hence it may be either total, partial, transient, periodical, or nocturnal. The causes of blindness are likewise various, such as weakness, or decay of the optic nerves, preternatural conformation of the organs, external violence, malignant effluvia, poisonous liquids dropt into the eye, too frequent exposure to intense heat, long confinement in dark places, &c.

As we propose to treat of the principal diseases of the eye, under the heads of CATARACT, GUTTA-SERENA, and SIGHT, we shall here only observe, that those unfortunate persons who are born blind, or lose their sight in infancy, seldom recover that important faculty, and ought therefore to be educated for such pursuits as are adequate to their individual capacities. It is, indeed, equally cruel, and inconsistent with good policy, to suffer these pitiable beings frequently to spend a vagrant life, and remain in the darkest ignorance. On the contrary, it has been uniformly observed, that the privation of one sense renders the others comparatively more acute and useful. Hence blind persons generally hear better, and possess a more accurate sense of touch, than those who enjoy all their sensitive faculties; and we have also many instances of the poetical and philosophical talents displayed by the former.

With a view to contribute our share towards alleviating the severe lot of such unfortunate individuals, we shall here communicate an invention of Mr. THOMAS GRENVILLE, organist, of Ross, in Herefordshire; who, in the year 1770, received a premium of fifteen guineas; and, in 1785, for some additional improvements, the silver medal, from the *Society for the Encouragement of Arts, &c.* It is remarkable, that the ingenious inventor is himself deprived of sight; and that by the use of this machine, any blind person may be taught the elements of arithmetic, namely, addition, subtraction, multiplication, division, reduction, and the rule of three, whether in money, weights, or measures of every kind, as perfectly as it may be performed on paper. His apparatus being of a simple construction, and so contrived that it may be of service in teaching the art of reckoning, to young children, in a very easy and entertaining manner; we shall first give an account of this machine, as represented in the subjoined cut, and then conclude with a description of its mechanism.



It consists of a box nineteen inches square in the clear space within, and near two inches deep, dividing into cells, containing the figures, lines, &c. hereafter described, necessary for performing the rules of arithmetic. The lid or cover of the box, which serves as a leaf, or slate, is pierced full of holes in parallel rows; the first row has eighteen large, and seventeen small holes, alternately placed; the second row, eighteen small holes, placed under the above large ones; the third as the first, and so on alternately, thirty-five rows the whole cover being full, and containing three hundred and twenty-four large holes, and six hundred and twelve small ones, which make an exact square. The figures are represented by pegs with cubical heads, and distinguished by pins placed on one side in the following manner. One, is expressed by a pin's point on the right hand, two, by the same in the middle

and three, by having it on the left hand; four, five, and six, by pins' heads in the above three different situations; seven, eight, and nine, by crooked pins, or *staples, in the same manner:* the cypher is understood by a plain peg, without any mark. On the top of each peg is printed the figure which it represents, to render the work intelligible to any person that may see it, without being acquainted with the marks. These pegs are made to fit the large holes. Pieces of brass wire, bent to a right angle, about half an inch from each end, and made to fit the small holes, serve for the purpose of lines, to separate the different parts of the work.

The box contains twenty-eight partitions; situated as in the preceding cut, ten of them to hold figures, and the others for the lines of different lengths.

A, The box with its several divisions, containing the different pegs, bars, &c. with which the rules in arithmetic are to be performed. B, The cover, which when turned back, and standing on its feet as represented, shews the holes wherein the pegs and bars are occasionally placed to exhibit the value of the figures. C, The pegs marked in such manner as to enable the blind person to distinguish by the touch, what each peg is intended to represent, when placed in the hole in the cover B.

A complete specimen of this machine may be seen in the *Repository of the Society,* Adelphi-buildings, London.

With respect to the education of the blind, we have already remarked, that it deserves public sympathy, and the interposition of the legislature; as their natural industry, and persevering application, will enable them to overcome the greatest difficulties, and amply repay the trouble and expense bestowed on their mechanical or literary acquirements. To strengthen their faculties, and preserve their health, *blind children* should never be suffered to remain idle, so that during the hours of recreation, they ought to take suitable exercise, such as riding on horseback, walking out in fair weather, the use of dumb bells, the bath chair, &c. In regard to diet, their meals should be temperate, light, and of easy digestion. Vegetables the most farinaceous, and least acescent, should be preferred to animal food. Neither fermented liquors, nor ardent spirits, should be given them, except in cases of general debility. Tea is likewise pernicious, and their regular drink ought to consist of equal parts of milk and water. a little chocolate, and coffee, may occasionally be granted; but infusions of balm, sage, or ground-ivy, are more wholesome. Tobacco and snuff must be absolutely prohibited; and on the whole, blind persons should neither be too much restricted to the observance of a rigid system of diet, nor allowed to eat and drink whatever is suggested by their own fancy: in the former case, they are apt to become pitiable slaves to custom; and, in the latter, it is a shameful dereliction of duty in those whom Providence has enabled to see, and direct their affairs.

Blindness, in farriery, is a disease incident to the eyes of horses, but more particularly to those of an iron grey, or dapple-grey colour, and is supposed to proceed from riding them too hard, or backing them at too early an age. This disorder may be discovered by the walk or step, which, in a blind animal, is always uncertain and unequal, when led; but if he be mounted by an expert horseman, an apprehension of the spur may induce him to move with more freedom, so that the blindness can scarcely be perceived. A horse may also be known to have lost his sight, if observed constantly to prick up his ears, and move them backwards and forwards, on hearing any person enter the stable.

The ordinary cause of blindness in horses, is attributed by Dr. Lower, to a spongy excrescence growing in one, and sometimes in two or three places of the coloured part of the *iris,* or which being ultimately overgrown, covers the pupil when the horse is brought into the light, but again dilates on returning him to a dark stable.

BLIND-WORM, (*fragilis*), or slow-worm; a species of the *Anguis,* or snake. It is about a foot in length, and of the thickness of the little finger. Its name is derived from the slowness of its motion, and the smallness of its eyes. It is chiefly found in gardens and pastures.

The Rev. Mr. Foster, in his "*Observations on noxious animals,*" asserts, from his own experience, that the bite of this creature is perfectly harmless; and he mentions two cases in which it was not attended with any ill consequences. These observations are farther corroborated by a passage in the twenty-ninth volume of the *Monthly Review,* respecting a dog having been

bitten by a slow-worm without any ill effects.

BLISTER, in medicine, signifies either a thin bladder, containing a watery humour raised on the skin, or the application of vesicatories to different parts of the body. With this intention, Spanish flies, or the species of cantharides found on the potatoe leaf in several of our states, are most commonly employed; though, we are possessed of a great variety of indigenous plants, which might be effectually substituted. Hence we recommend, from experience, the following: 1. Mustard-seed mixed with vinegar sufficient to convert it into a thick paste, to be spread upon linen; 2. The fresh root of the horse-radish, grated, or in fine shavings; 3 The bruised leaves of the different species of the *Ranunculus*, or crow-foot; 4. The leaves of the *Polygonum hydropiper*, or water-pepper, growing wild on the banks of rivulets; and 5. The most powerful of all indigenous vegetables, the *Daphne Mezereon*, or spurge olive, every part of which is extremely acrid, but the rind is preferably used for blisters. Whether fresh, or dried, this rind should be previously steeped for a few hours in strong vinegar, and then a piece about one inch broad, and two or three inches long, tied over-night to the part. after it has sufficiently drawn, the blistered place is covered with an ivy leaf, and a similar vesicatory is applied contiguous to the former. In this manner, it is continued, according to particular circumstances, especially in chronic diseases, till the desired effect is attained. Where no time is to be lost, we advise the use of mustard seed, as before described, with the addition of a little salt, which greatly increases its efficacy. These cataplasms are often more proper than the blisters prepared with Spanish flies; because the former operate more speedily, and act with less violence on the fluids than the latter. Hence they are of eminent service to promote critical eruptions, to prevent the small-pox from breaking out on the face, when applied at the commencement of the disease, either to the calves of the legs, or the soles of the feet, to mitigate the pain arising from internal inflammations, to drive catarrhal and rheumatic humours from the more essential organs of life to the proximate external parts, and to rouse the indolent powers of Nature. In the most acute pains of the head, and the tooth-ach proceeding from a rheumatic cause, as well as in inflammatory affections of the eyes, such plaisters may be usefully applied to the neck or the arm; in inflammations of the chest, to the breast and between the shoulders; in apoplectic fits, to the temples, &c

In paralytic diseases, it is of the utmost consequence to place the blister in that direction which corresponds with the situation of the nerves in the part affected; and in rheumatic disorders, such places should be preferred as contain nerves connected with the painful part, immediately under the skin Thus, in the most acute lumbago, or sciatica, it would be of little use to blister the hip or thigh, where the nerves are situated deep in the muscles: but by applying a vesicatory to the sole of the foot on the same side, we may promise almost certain relief.

In the second stage of inflammatory diseases; in low fevers where a tendency to delirium takes place, and prostration of strength prevails, they are highly useful when applied to various parts of the body.

We shall farther observe, that in acute and dangerous diseases, where it is often necessary to repeat the application of blisters, to the same part, the new one should never be delayed till the former is completely healed. But, with respect to the time they are to be left on the skin, much depends on the degree of irritability in the patient, as well as the relative strength of the plaster. Some constitutions, of an irritable fibre, experience its effects in less than half an hour, while in others it may remain four, six, or eight hours, without raising the skin. In opening a blister it is not necessary to cut away the epidermis, or scarf skin, and to cause unnecessary pain and irritation, as a single longitudinal incision is sufficient to give vent to the collected humour.

Blisters sometimes operate on the urinary canal, and produce a painful stranguary, or difficulty of making urine; this effect may be remedied by the internal use of camphor, assisted by diluent emulsions, such as decoctions of barley, linseed, solutions of gum arabic, &c. or by pouring warm water from a bottle, upon the lower part of the belly, as the person lies in bed; and to prevent such accidents, the blister itself may be mixed with camphor. If, on the other hand, they will not draw, the skin ought to be previously rubbed with strong vinegar, or, if their

action be too violent, a little of the extract of henbane may be added to the composition.

BLOCKADE, in military affairs, the blocking up a place by posting troops at all the avenues leading to it, to keep supplies of men and provisions from getting into it; and by these means proposing to starve it out, without making any regular attacks To *raise a blockade*, is to force the troops that blockade to retire.

BLOCKS, the usual name on board ship for pullies The blocks now used in the British navy are made in Portsmouth by means of circular saws and other machinery, which have been lately erected by a most ingenious mechanic. This machinery performs the several operations from the rough timber to the perfect *block*, in the completest manner possible The whole is worked by means of a steam engine; the manual labour required is simply to supply the wood as it is wanted to the several parts of the machinery, so that the commonest labourer almost may be made to act in this business with very little instruction

BLOOD a red homogeneous fluid, of a saltish taste, and somewhat urinous smell, and glutinous consistence, which circulates in the cavities of the heart, arteries and veins. The quantity is estimated to be about twenty-eight pounds in an adult: of this, four parts are contained in the veins, and a fifth in the arteries The colour of the blood is red; in the arteries it is of a florid hue, in the veins darker, except only the pulmonary veins, in which it is of a lighter cast Physiology demonstrates, that it acquires this florid colour in passing through the lungs, from the oxygen it absorbs, [or from the carbon it gives out.

The blood in insects and worms is white —T C]

The human body is, by Dr. KEILL, supposed to contain at least one half of its weight in blood, including in this computation all that exists in the lymphatic ducts, nerves, or any other vessel This computation, however, is exaggerated; and we believe that the greatest quantity in a full grown adult, seldom exceeds thirty pounds weight Its most remarkable property is that of incessantly circulating in the cavities of the heart, arteries and veins, while the animal is alive Although HIPPOCRATES appears to have possessed a faint idea of this admirable process, when he says that, "all the blood vessels spring from one; and that this one has neither beginning nor end; for where there is a circle there can be no beginning;" yet as he was not acquainted with the office of the valves, he could neither comprehend nor demonstrate, the circulation of the blood. This most important of all discoveries in physiology, was reserved for the immortal HARVEY, who first ascertained the true nature and uses of the valves, and about the year 1616, taught, in his Lectures at Cambridge, that justly admired doctrine, the substance of which he published in 1628. He proved that in most animals, the blood circulates in arteries and veins, and through the medium of one, two, or more hearts, (see ANIMAL KINGDOM) that in arteries it moves from the trunk to the branches, and that, meeting there with the branches of veins, it returns in a languid state to the heart; that the heart communicates a new impulse, and propels it to the trunk of the arteries; and that by these, the thickness of their coats, exerting muscular force, again drive it into the veins. Valves are situated in every part of this circulating course, in order to prevent the return of the blood

The colour of this fluid in the arteries is of a florid hue: but somewhat darker in the veins, except in those of the lungs, in which it is of a lighter cast. When exposed to the open air, the blood gradually separates into two parts, namely, the *serum*, or a yellowish, sometimes greenish fluid, and the *crassamentum*, or cake, which resembles a red mass swimming distinctly on the top. The latter contracts greatly in its dimensions, and increases in solidity; properties which depend on the state of the individual at the time when the blood is drawn Hence, in vigorous persons, when attacked with an inflammatory disease, the solid part is so tough that it resembles a piece of flesh; but when fresh drawn the red particles subside, and produces what has therefore been called the *buffy coat*; whereas, in other diseases, it is very soft and tender, breaking in pieces on the slightest touch. By chemical analysis, it discovers the same principles with other animal substances; yielding in distillation a volatile spirit, a great quantity of phlegm, and fœtid oil; lastly, there remains a charred matter, which, when burnt in the open air, leaves a white earth similar to calcined hartshorn According to some chemists, however, it contains both an

acid and an alkali. But the most remarkable circumstance in the blood, is its texture, which consists of millions of red globular particles, or more properly, as Mr. HEWSON calls them, flat vesicles, each of which has a little solid sphere in its centre. He observes, that they are flat in all animals, of very different sizes in different creatures, and impart to the blood its red colour. In man, they are small, perfectly flat, and appear to have a dark spot in the middle. To see them distinctly, he diluted the blood with fresh serum. Their shape he supposed to be of great importance, but it can be altered with a mixture of different fluids. By a determinate quantity of neutral salt contained in the serum, this fluid is adapted to preserve those vesicles in their flat shape; for, if mixed with water, they become round, and dissolve perfectly, but on adding a little of any neutral salt to the water, they remain in it without dissolving, or any alteration of their form.

The uses of the blood in the animal economy are so various and important, that some have not scrupled to maintain that it is possessed of a vital principle, from which the life of the whole body is derived. This opinion was formerly entertained by HARVEY, and has lately been revived and supported by JOHN HUNTER. So much is certain, that the blood, after being exposed to the action of atmospheric oxygen in its passage through the lungs, gives out superfluous carbon, for the oxygen is converted into carbonic acid, and the air expired precipitates lime-water: it then stimulates the cavities of the heart and vessels to contract, and its circulation contributes to generate the heat of the body, and propagate it to the remotest parts; in short, it nourishes every part, and supplies all the secretions, which, without exception, are separated from the blood. Hence it forms the bones, ligaments, tendons, membranes, muscles, nerves, vessels, and the whole organised body, when subjected to the organic property of assimilation. As it unites living parts, it must itself possess life.

The blood is of different degrees of viscidity in different animals, and even in the same creature at different times. It always possesses a considerable degree of tenacity, which, however, is remarkably greater in strong than in weak animals: thus the blood of bulls was used by the ancients as a poison, on account of its extreme viscidity, which renders it totally indigestible by the human stomach.

Blood is used in the arts, for making Prussian blue; sometimes for clarifying certain liquors; and very large quantities are used in the manufacture of loaf sugar. [It is also used in dyeing the Turkey or Adrianople red.—T. C.] In horticulture, it is recommended as an excellent manure, when poured in the spring on the roots of fruit-trees, having previously removed the soil round the trunk: thus employed, it promotes the growth of the tree, and enriches its fruit. A mixture of blood with quick-lime, forms an exceedingly strong cement, and has therefore been used in preparing chemical lutes, as well as in making the floors of common farm-houses, and other humble habitations For the latter purpose, a mixture of clay, ox blood, and a moderate portion of sharp sand, beaten well together and uniformly spread, produce a neat, firm floor, and of a beautiful colour.

BLOOD-HOUND, *Sanguinarius*, a species of dog remarkable for possessing the sense of smelling in the highest degree. This animal is distinguished by his long, smooth, and pendent ears, broad chest, muscular form, a deep tan colour, and is generally marked with a black spot above each eye. We believe the breeding of this species has of late years been neglected.

These animals were formerly much employed in the discovering of game that had escaped, or been stolen out of the forest. From the acuteness of their smell, they are said to have also been able to trace the footsteps of man with the greatest certainty; hence they were trained for discovering delinquents who endeavoured to escape the hands of justice.

Dogs of this species were taken to Jamaica by Lord Balcarras, to hunt down the maroons, in the interior of the island.

BLOOD-SHOT EYES, an inflammation of the membranes which invest the eyes. We shall at present state the first, and most necessary rules for preventing the progress of inflammatory complaints, namely, rest and exclusion of light, without heating the eye by a close cover; cold fomentations repeatedly applied, when they become warm; abstinence from animal food, and all heating or stimulating liquors; mild aperients; and if these do not produce the desired effect, leeches may be applied near the eyes; though drawing

blood by cupping and scarifying near the temples, has generally been found more effectual.

BLOOD-SPAVIN, in farriery, is a swelling and dilatation that runs along the inside of the horse's leg, forming a small, soft tumor in the hollow part, and is not unfrequently accompanied with weakness and lameness of the part affected.

The cure of this disorder should be attempted with restringents and bandages, which will be found very efficacious in strengthening the joints.

BLOOD-STONE, or Hematites, is a hard mineral substance of a red or purple colour. It is found in masses of different forms, and contains a considerable portion of iron, but the blood-stone itself, on account of its hardness, serves to burnish or polish metals. [It is sometimes applied to green quartz, or jasper, with red spots of oxyde of iron.—T. C.]

Dragon's Blood. See DRAGON.

BLOOD-LETTING, in surgery, is performed with a view either to diminish the quantity of the circulating fluid, or to relieve a particular part, in case of inflammation, and, consequently, it is either general or local.

General blood-letting, is that which is performed upon a vein or an artery: hence we have the terms *phlebotomy* and *arteriotomy*.

Local, or topical blood-letting, is performed by scarification and cupping-glasses, by leeches, or by punctures made with a lancet, according to the nature of the disorder. This latter, or topical blood-letting, is never dangerous, but in many cases has been found effectual in relieving the patient. With respect to venesection, however, as different opinions are entertained of its utility by different physicians, it may not be improper to offer a few remarks.

There was a period, during which blood-letting was in very general use, and obtained great credit, as one of the most effectual means of prolonging life: while a *plethoric habit* was supposed to be a principal cause of early dissolution. Through the veins thus regularly opened, at certain seasons the superfluous or vitiated blood was emitted, while that of a more salubrious quality was supposed to be left behind. It is now well known, however, that the corrupted part of the blood cannot be separated from the mass, so as to preserve the remaining particles sound and uncorrupted. If the quality of the blood ever become vitiated and diseased; if it be too thick and viscous, or too acrid and serous, the whole mass necessarily participates in the infection: neither is it in the power of art to contrive any method, by which the corrupted part may be separated from that which is in a sound state. It would be equally unreasonable to expect, that a spoiled cask of wine could be cured of its tartness, by attempting to draw the acid and impure portion from the top, in order to leave the sweet and wholesome part behind.

Considered as a remedy, phlebotomy must certainly be allowed to possess its uses; it is sometimes a necessary expedient, to produce an immediate diminution of the fulness of the blood, and of too great arterial action, particularly when the time is too short, and the danger too pressing, to admit of any other method for effecting that purpose.

The blood contains in itself, and affords to the vessels, nerves, muscles membranes, tendons, ligaments, bones, in short, to the whole organised body, all the substance and properties which enter into the formation of each, and constitute them what they are. Each of these parts is evolved from the blood, and adapted to its proper place, in so wonderful a manner, that the human mind is totally at a loss to comprehend how this operation is performed: neither have the researches of the most acute and attentive observer been able to account for it. And as the blood serves to supply the waste, and to make up the losses, which those parts occasionally sustain, it may be considered as the original source of our whole organisation. Now it requires little reflection to perceive, that by wasting this vital fluid, the sources of animal support and regeneration are in a great measure obstructed and diminished. Although it be true, that the blood lost by periodical bleedings is soon reproduced by the activity of the vital powers, yet this restoration is not effected without considerable efforts, and at the expense of the whole machine. As this exertion, therefore, is a great pressure upon the vital powers, it must of course be attended with a proportionate degree of their consumption. And experience has shewn, in numberless instances, that persons accustomed to frequent blood-letting, are not only rendered more delicate in their constitution, and more subject to diseases, but also that they die in general at an earlier age than others.

A very common accident in performing the operation of bleeding, is the wound of a tendon. Where this has happened, pain and tension are perceived near the part where the orifice was made; inflammation comes on, and extends the whole length of the limb. To cure this complaint the limb must be kept perfectly quiet, and in the most *relaxed position possible*. Apply double linen cloths dipped in lead water, made by dissolving half an ounce of sugar of lead in a quart of rain, snow, or river water: give gentle laxatives, and observe a low diet.

Blood-letting, in *farriery*, an operation often undertaken when it is as useless and pernicious as in the human species Such horses, however, as stand much in stable, and are full fed, occasionally require bleeding, especially when their eyes are heavy and inflamed, or when they feel unusually hot, and champ their hay.

Young horses should be bled when they are shedding their teeth, as it allays those feverish heats to which they are subject at that period: but the cases that more particularly require bleeding, are colds, falls, injuries of the eyes, strains, and all inflammatory disorders.

These noble creatures should always be bled by measure; two or three quarts are generally a sufficient quantity: and when venesection is repeated, strict attention should be paid both to the disease and constitution of the animal.

BLOOD-VESSELS, in anatomy, are long membranous canals, which convey the blood through every part of the body. They are divided into two classes, arteries, and veins.

The *veins* originate from the extremities of the arteries, and return the blood from them into the auricles of the heart, which is the common termination of all the veins Like the arteries, the veins are also composed of three membranes, but more delicate than those of the former, and nearly transparent; they are divided into trunks, branches, ramuli, &c. In general the veins are situated by the sides of the arteries, but more superficially; and as they proceed towards the heart, they gradually become larger. As the veins do not pulsate, the blood, which they receive from the arteries, is urged forward, partly by the contractibility of their coats, partly by the pressure of the blood from the arteries, and partly by respiration. They are moreover furnished with valves, which prevent the return of the blood. See BLOOD.

BLOODWORT, the Small-grained Dock, or the *Rumax sanguineus*, L. is a plant seldom cultivated, as it so quickly propagates that it becomes a troublesome weed. See WITHERING, 353.

The fresh leaves and stalks of this vegetable afford a juice of a dusky blood-red colour; which, after standing for a short time, changes to a dark blue or violet tint: and if prepared with alum, it might probably be used in dyeing. This juice when laid over other colours in painting imparts to them an additional lustre, and may be used, if properly mixed, either as a red or blue colour.

Bloody Flux. See DYSENTERY.

BLOOM, a mass of iron, that has undergone the first hammering.

BLOSSOM, in general signifies the flowers of plants. See FLOWER. It is also applied to the flowering of trees in the spring, called their bloom The use of the blossom to the vegetable is, partly to protect, and partly to draw nourishment for the embryo fruit or seed.

BLOW-PIPE, in chemistry and mineralogy, an instrument by which the breath may be directed in a stream upon the flame a lamp, or candle, in order to vitrify a small quantity of mineral substance. The process of assaying in the dry way, may readily be performed in the same manner.

Most of the experiments which can be made by means of a large apparatus, may also be accomplished by the blow-pipe, in a much shorter space of time, while even the smallest particle of the matter is sufficient. "The first inquiry to be made," says M. BERGMANN, "is, *what* a substance contains, not *how much*" Experiments with the blow-pipe have this advantage over those conducted in crucibles, that we can distinctly see all the phenomena from beginning to end; by which means we obtain an illustration of the series of operations and their causes.

Mr. ROBERT HARE, of Philadelphia, invented a machine, which he calls a hydrostatic blow-pipe, for the purpose of burning inflammable air, (hydrogen gas), with oxygen, (pure air) propelled by the pressure of a column of water.

A long, powerful, and steady flame is produced which fuses platina, lime, magnesia, &c. The machine is so contrived, as to contain the two airs with-

out mixing, and these may be either atmospherical air and imflammable air, or oxygenous air and inflammable air, as the operator pleases; or he may fill it with atmospheric air alone, to act upon the inflammable air, which forms the flame of a lamp For these reasons it will be immediately apparent how preferable it is to the bellows with a pedal, or to a crucible. [This machine has been improved greatly by Mr CLOUD, of the Mint, in Philadelphia, and is, upon the whole, preferable to Mr. NEWMAN's and Dr. CLARK's blow-pipe. The most convenient blow-pipe, is a gasometer inverted in water, and filled with common air, and pressed by a weight. —T. C.]

BLOWING, an agitation of the air by means of a pair of bellows, the mouth, &c. Butchers have a very pernicious custom of blowing meat, to deceive the buyer. The sudden change of veal and lamb in particular, may, in some degree, be attributed to this cause. It is also a common practice to blow poultry, and all sorts of fish, except those of the shell kind. The method of blowing fish, especially cod and whiting, is, by placing the end of a quill, or a tobacco-pipe, at the vent, and making a hole with a pin under the fin which is next the gill; consequently the fish appears large and full, but when dressed will be flabby, and little else but skin and bones. By placing the thumb on each side of the vent, and pressing it hard, the air may be perceived to escape, and this imposition be detected.

As the venders of provisions, who are guilty of such disgusting practices, may at the same time be infected with the most loathsome diseases, the articles thus polluted should be rejected as being unfit for consumption. Indeed, the pernicious tendency of blowing meat is obvious, and ought, therefore, to be discouraged by every class of purchasers, while it claims the serious and vigorous interference of the public magistrate.

Blowing, in botany, is the gradual and perfect expansion of flowers.

Blowing of Glass, is performed by dipping the end of an iron blow-pipe into melted glass, and blowing into it. See GLASS.

BLUBBER, the fat of the whale and other aquatic animals. It lies immediately under the skin. In the porpoise it is firm, fibrous, and about an inch thick; in the whale, it is commonly six inches in thickness. Formerly the blubber was boiled down into train-oil on the shores of Greenland, and other places, where the whales were caught, but it is now brought home in casks, and undergoes that process in Britain. The quantity of blubber yielded by a whale is forty, fifty, nay, sometimes, eighty hundred weight

BLUE, is one of the seven colours of nature, into which the rays of light divide themselves when refracted through a prism The principal blues used in painting, are, Prussian blue, bice, Saunders' blue, azure or smalt, verditer, &c for the preparation of which, see COLOUR-MAKING. In dyeing, the principal ingredients which afford a blue colour are indigo and woad.—See also DYEING

Bishop WATSON, in his Essays, vol 1, has related an experiment by which he produced one of the most vivid blues he ever saw Into a solution of green vitriol (sulphate of iron) he poured an infusion of raspings of heart of oak in hot water, and the colour just mentioned was instantly formed. If the raspings be boiled for an hour in water they lose their property; and if the solution of vitriol be poured upon the dry raspings, the whole is changed into a blue mass

The *Dutch Blue*, commonly called Turnsol, may be prepared by the following process: The kind of lichen called archil, or, in default of it, the large oak moss, being dried and cleansed, ought to be reduced to powder, and by the assistance of a press, forced through a sieve, the holes of which should be small. This powder should be then mixed in a trough with an alkali called vetas, or the ashes of wine lees, in the proportion of one-third ashes, and two-thirds lees. This composition being moistened with human urine, a fermentation is excited, and a due degree of moisture preserved by the addition of the same liquor When it assumes a red colour, it should be removed into another vessel, again moistened with urine, and stirred, to renew the fermentation In a few days the blue colour will begin to appear, and it must then be carefully mixed with a third part of pure powder of potash; after which it should be removed into wooden pails, three feet high, and six inches broad. As soon as the third fermentation begins, it ought to be mixed with pulverised chalk or marble. The last gives no addition but in weight.

To prepare Blue Colour from Verdigris. Take sal ammoniac and verdigris, of

each 6 ounces; mix them well together with one ounce of tartar, to a paste: put this into a vial and stop it close; let it stand for several days, and you will have a fine blue colour: [or, precipitate blue vitriol sulphate of copper, by means of caustic potash, or caustic soda, or carbonate of these alkalies: some of these blues, with oil, turn to a fine green.—T. C.]

A fine blue colour, equal to ultramarine, may be made by collecting the blue corn-bottle flower, or *Centaurea cyanus*, which abounds in almost every corn field: it has two blue tints; the one pale in the larger outward leaves, the other deeper, which lies in the middle of the flower; by rubbing the last, while fresh, so as to express the juice, it will yield a beautiful and unfading colour.

On the same day that the flower is gathered, the middle should be separated from the extremities, and when a quantity of the juice is obtained, a small addition of alum will produce a permanent, clear blue, which, in the opinion of many persons, is not inferior to ultramarine.

A fine colour has lately been discovered by Mr. THOMAS WILLIS, which promises to be useful in the art of painting. It is prepared by mixing a solution of alum and martial vitriol with the mother water, which remains after extracting the crystals of phosphorated soda from a combination of the phosphoric acid with pure mineral alkali.

Our limits not permitting us to relate his various experiments, the curious reader will consult Mr. WILLIS's "*Account of, and observations on, different blue colours produced from the mother water of soda phosphorata*," &c. which is inserted in Vol. 4, of the "*Memoirs of the Literary and Philosophical Society of Manchester*"

BLUE-BIRD, *Motacilla Sialis*. The head, neck, back, wings and tail, are of a sky-blue colour; breast of a red or brick colour; the bill short, the upper mandible bending downwards a little at the point. The blue-bird is of a friendly social nature. The attachment of the male towards the female, is remarkable and pleasing He seldom permits her to be out of his sight, and eagerly darts upon a favourite morsel, and carries it to her. They pair in March, and the female lays two or three eggs in a season. The male takes care of the former broods as soon as fledged, whilst the female sits on the eggs of the succeeding ones.

The notes of the blue-bird are invariably the tidings of fine weather, for although he is not strictly a bird of passage, yet in severely cold weather, he disappears for a short time, returning to the sea-coast, where the air is milder, or a few days journey south, but is sure to return with a southerly wind or milder air, when he approaches his accustomed place of residence. Their food consists of all kinds of insects, beetles, and grasshoppers; they seldom feed on fruit or vegetable substances. This innocent bird is highly worthy of our protection.

[BLUE BLACK Burn vine stalks in a covered crucible —T C]

BLUE-BOTTLE (Corn), or the *Centaurea cyanus*, L is a plant common in corn-fields See WITHERING, 472; and *Eng. Bot* 277. This vegetable is considered as a weed; but besides the property of affording a valuable paint, as mentioned in the article BLUE, it is also much frequented by bees. A decoction of the flowers with galls and copperas, affords a good writing-ink; and it may also be employed with success in the dyeing of linen or cotton [It is fugitive —T C.]

BLUE-GRASS See GRASSES.

BLUEING, is the art of communicating a blue colour to different kinds of substances. Laundresses blue their linen with smalt, [or with liquid blue, made by dissolving one ounce of finely powdered indigo in 7 ounces of strong oil of vitriol, and then diluting it — T C] Dyers blue their stuffs and wools, with woad or indigo

Blueing of metals is performed by heating them in the fire till they assume a blue colour; it is particularly practised by gilders, who blue their metals before they apply the gold and silver leaf

Blueing of iron and steel, is a method of beautifying that metal for mourning buckles, swords, &c. The process is as follows: Take a piece of grind-stone or whet-stone, and rub hard on the work, to take from it the black scurf; then heat it in the fire, and as it grows hot, the colour changes by degrees, appearing first of a light, then of a darker gold colour, and lastly of a blue. Sometimes they also grind indigo and salad-oil together; and rub the mixture on the work, while it is heating, with a woollen rag, leaving it to cool gradually.

BLUE JOHN, *Fluate of lime*, among miners, is a kind of mineral which has

lately been fabricated into vases and other ornamental articles. It is of the same quality as the cubical spar of Derbyshire.

BOABAB, or AFRICAN CALABASH-TREE, (*Adansona digitasta*) is probably the largest of all vegetable productions. The trunk, although not usually more than twelve or fifteen feet high, is frequently from sixty to eighty feet in girth. The lowest branches extend almost horizontally; and, as they are sometimes near sixty feet in length, they bend by their own weight to the ground, and thus the whole tree forms an hemispherical mass of verdure which measures from 120 to 130 feet in diameter.

The *fruit* is oblong, about ten inches in length, pointed at both ends, and covered with a greenish down, under which there is a blackish and woody rind. Its interior consists of a whitish, spongy, and juicy substance, with several brown seeds.

This tree is a native of Senegal and other parts of Africa.

The virtues and the uses of the Boabab and its fruit are numerous, and of great importance to the inhabitants of the countries in which it is found. The *bark* and *leaves* are dried, powdered and preserved in bags, to be employed as a seasoning for food. Two or three pinches of it are put by the negroes into their messes, under an impression that it promotes perspiration and moderates the heat of the blood.

The pulp of the *fruit* has an agreeably acid flavour. This is not only eaten when fresh, but is dried and powdered for medicinal uses; a kind of soap is also prepared from it.

In Senegal, when the trees are decayed, the *trunks* are hollowed by the negroes into burying places for their poets, musicians and buffoons. These persons are much esteemed whilst they live, although they are supposed to derive their superior talents from sorcery, or an alliance with demons. When dead, however, their bodies are regarded with horror, and are not allowed the usual burial, under a notion that the earth would in such case refuse to produce its accustomed fruits. The bodies inclosed in these trees are said to become perfectly dry without decaying, and thus to form a kind of mummies, without the process of embalmation

BOARD, a piece of timber sawed thin, for building, and other purposes.

A cheap and durable composition for preserving *weather-boarding*, may be made in the following manner.—Take three parts of air-slacked lime, two of wood-ashes, and one of fine sand, or sea-coal ashes. Sift these through a fine sieve, and let them be well mixed: then add as much linseed oil as will bring the whole into a consistence fit for working with a painter's brush At first, give the weather boarding a thin coat of this mixture: and when that is dry, it can be conveniently worked This composition is cheaper and more durable than paint: it is also impenetrable to water, and not liable to be injured by the action of the weather, or the heat of the sun.

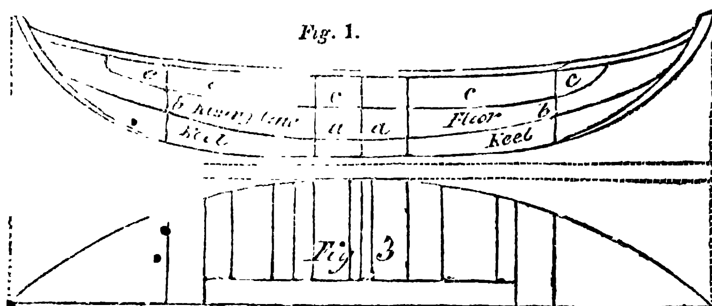
BOAT, a small open vessel, worked by oars or sails. The formation and names of boats are different, according to the purposes for which they are intended: hence they are slight or strong, with a keel, or flat bottom, open, half, or whole decked, and plain, or ornamented.

M. BERNIERES invented a boat which is not liable to be overset or sunk. Some trials were made with this vessel, at Paris, in the year 1777, in the presence of a vast concourse of spectators. Eight men went into the boat, and rocked it till it filled with water, and afterwards rowed it along the river in that state, without danger of sinking. M BERNIERES then ordered a mast to be erected in the same boat, when filled with water, and hauled down by a rope fastened to the top of the mast, till it touched the surface of the river, so that the vessel heeled in a position to which neither winds nor waves could bring her; yet as soon as the rope was let go, the boat recovered her equipoise in less than a second.—This experiment proved that the boat could neither be sunk nor overturned, and that it afforded the greatest possible security against accidents. Hence this invention is of the first importance to the inhabitants of maritime states.

In the year 1785, a patent was granted to Mr LUKIN, for his improvement in the construction of boats and small vessels, so that they will neither overset nor sink. This useful invention is described in the specification of the patent, as follows: To the outsides of boats and vessels, of the common or any other form, are projecting gunwales, sloping from the top of the common gunwale, in a faint curve, towards the water, so as not to interrupt the oars in rowing: and, from the extreme

projection (which may be greater or less, according to the size and use the boat or vessel is intended for,) returning to the side in a slight curve, at a proper distance above the water line. These projecting gunwales may be made solid, of any light materials that will repel the water, or hollow and water-tight, or of cork, and covered with thin wood, canvas, leather, tin, or any other light metal, mixture, or composition. These projections are very small at the stem and stern, and increase gradually to the dimensions required; they will effectually prevent the boat or vessel from being overset by sudden squalls, or violent gales of wind, either in sailing or rowing, or by imprudent or unskilful management. In the inside at the stem and stern, and at the sides (where the projecting gunwales are not necessary), and under the seats and thwarts, are inclosures, or bulkheads, made water-tight, or filled with cork, or other light materials that will repel the water: the spaces between the timbers may in like manner be filled up. By this means, the boat or vessel will be so much lighter than the body of water it must displace in sinking, that it will with safety carry more than its common burthen, though the remaining space should by any accident be filled with water. Under the bottom, along the centre of the keel, is affixed a false one of cast iron, or other metal; this will strengthen and protect the bottom from injury in many cases; and, by being placed so much below the surface of the water, will act as ballast with more power than a much greater weight in the common situation, and is much more safe, by being fixed in the proper place, and not liable to shift by any sudden motion of the boat or vessel.

BOAT, (LIFE) The object of this most useful invention, is to save the lives of persons wrecked on coasts The life boat was first built by Mr H[illegible]ry GREATHEAD, of South Shields, England. A plan and description of this boat were taken from Mr G's original, by Colonel WILLIAM TATHAM, and patriotically sent by that gentleman to Mr. JEFFERSON, President of the United States. From that draught, the annexed plate was taken, and we have no doubt, that if the boat be kept in readiness for use on our coasts, many lives may be annually saved.



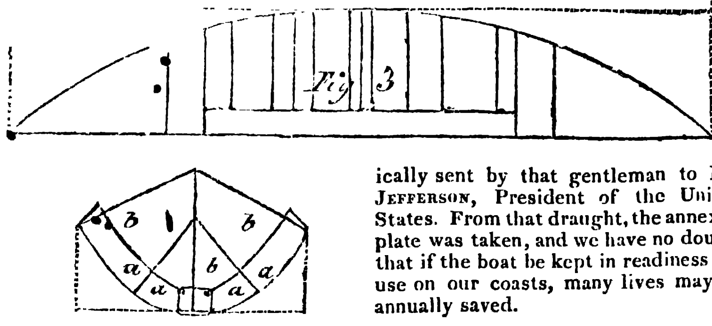


Fig. 2.

Description.—Fig. 1. Represents the side view of the boat, the length of the keel, with the convex remarked by the work keel; the rising line of the floor represented as corresponding with the rise of the floor in the body section.

Fig. 2. The situation of the frames for building, to agree with the corresponding letters in the body and side sections.

Fig. 3. The breadth of the top plane, with the situation of the thwarts; the half-breadth of the letters *c c c c c*, the length and depth of the cork on the outside.

Construction.—The boat to be built from a given length The breadth is one-third of the length, with both ends alike. The keel of the boat is a plank, bearing a proportional breadth in the mid-ships, narrowing towards the end to the thickness of the bottom of the stems, and forming a convex downwards. The stems are the segment of

a circle, with a considerable rake. The bottom section to the floor heads, is a curve with the sweep of the keel; the floor head curving. A bilge plank is worked on each side, next the floor head, with a double rabbit groove, of a thickness nearly similar to the keel, on the outside of which are fixed two bilge trees corresponding nearly on a level with the keel. The ends of the bottom section from the part of the cable bow, more eliptical to the top, projecting considerably, each end the same. The sides from the floor heads to the top of the gunwale, flaunch on each side in proportion to nearly half the breadth. The breadth of the boat is continued well towards the ends, leaving a sufficient length of straight side at the top. The shear is regular along the straight side, and more elevated towards the ends. The gunwale is fixed on the outside; the outside is cased with cork the whole length of the regular shear, from the under part of the gunwale to twenty three inches down the depth of the side. The cork has several thicknesses, so as to project at top a little without the gunwale, and is secured with plates of copper. The quantity of cork employed in the construction is about 700 wt. The thwarts are five in number, all staunchioned, and row double-banked, with ten oars. The oars are short, fixed by iron thole pins, and slung with graummets, to enable the rowers to pull either way. The boat is steered by an oar at either end, and the steering oar is one-third longer than the rowing oar. The platform in the bottom is placed horizontally. The length of the midships, and the sides from the bottom to the under part of the thwarts, is cased with cork. At the ends, the platforms are more elevated, for the convenience of the steersman, and to give him a greater command of power with the oars.

Practical Remarks.—The curving keel and bottom permit the boat to be turned with facility: she is kept more easily in equilibrium than any other shape; is more easily steered, and safer among the breakers; the great rake of the stems, and fine entrance below, forming part of the cable bow. This construction is superior to all others in a high sea and broken water; and with the projection to the top of the gunwale, is the means when the boat is conducted to head the sea, of dividing the waves which generally break into a common boat. The breadth being continued well to the ends, supports the boat when rowing against the waves; and both ends being similar, she is always in a position to be rowed either way without turning. The addition of the staunchions under the thwarts, admit the boatman to act with a firmer force, and in the instance of the boats striking the ground, the weight of the men, by the communication of the staunchions, will, in some degree, resist the shock. The advantage of a short oar, in a high sea, is obvious. It is more manageable, and permits the rower to keep his seat; but the long oar in the midst of agitated waves, would be unwieldy, and the stroke frequently uncertain. The cork on the outside is a most excellent defence, and displaces a large column of water: and it has been proved by experience, to float the boat with the principal part of her bottom stove and loose. The great projection of the cork also, on the outside, prevents her being overturned. The best method of conducting the boat, is to head the sea; which from her construction, aided by the force of the oars, will launch her over the water with rapidity, without taking in any water.

"The person who steers the boat should be well acquainted with the course of the tides, in order to take every possible advantage; and great care should be taken in approaching the wreck, that the boat be not damaged, as there is frequently a reflux of the sea near the wreck: when the wind blows to the land, the boat will return to the shore before the wind and sea, without any other effort than steering. Signed—Henry Greathead."

Mr. Greathead stated, "That he conceived the principle of his invention from the following idea, which had frequently occurred to him, viz. Take a spheroid, and divide it into quarters, each quarter is elliptical, and nearly resembles the half of a wooden bowl, having a curvature with projecting ends; this thrown into the sea, or broken water, cannot be upset, or lie with the bottom upwards."

The testimony laid before the committee of the House of Commons, by persons of credit who had either used the boat, or had witnessed its use by others, leaves no room to doubt of its being fully adequate to the purposes for which it was intended. Capt. Gilfred Lowson Reed, an elder brother of the Trinity-house, observed to the committee, "That when the sea does not

Perspective View.

Fig. 1.

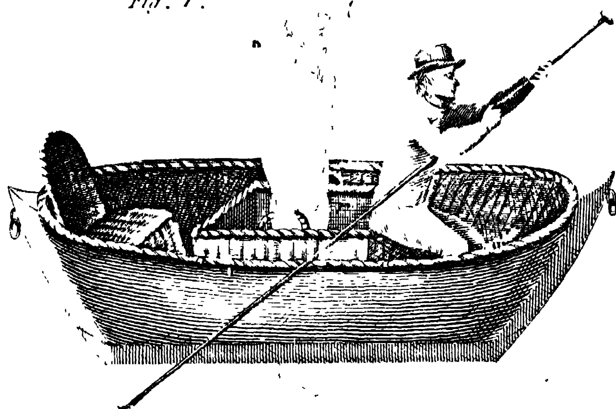


Fig. 2.

Plan.

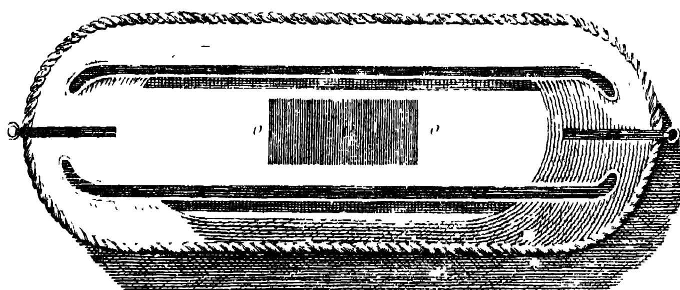
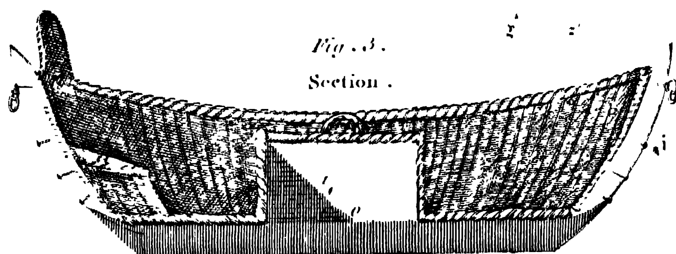


Fig. 3.

Section.



ICE BOAT.

Newly invented by Thomas Ritzler of Hamburgh

tumble in upon the beach very much, the boat may be easily launched by laying the ways as far as possible in the water, and the carriage hauled from under her: when there is a great sea on the beach, the boat must be launched from the carriage before she comes to the surf, on planks laid across, as other boats are launched, the people standing on the ends to prevent the sea moving them; then, with the assistance of the anchor and cable (which has been laid out at sea for that purpose) the boat's crew would draw her over the highest sea.

"Upon the boat returning to the shore, two double blocks are provided, and having a short strap fixed in the hole, in the end of the boat next the sea, the boat is easily drawn upon the carriage."

Mr. THOMAS HINDERWELL stated, "That the peculiar nature of the curvature of the keel of the boat, is the foundation and basis of its excellence. It regulates, in a great measure, the shear with the elevation towards the end. This construction spreads and repels the water in every direction, and enables her to ascend and descend with great facility over the breakers. The ends being reduced regularly from the centre, to less than one-third proportion to the mid-ships, both ends are lighter than the body section. By means of the curved keel, and the centre of gravity being placed in the centre of the boat, she preserves an equilibrium in the midst of the breakers. The internal shallowness of the boat in the body section, occasioned by the convexity of the keel, and the shear of the top, leaves so small a space for the water to occupy, that the boat, though filled with water, is in no danger of sinking or upsetting. The buoyancy of the boat, when filled with water, is also assisted by the cork being placed above the water line."

BOATS, (ICE) a modern invention of THOMAS RITZLER, of Hamburgh, whose name deserves to be transmitted to posterity; as his ingenious and useful contrivance has already saved many valuable lives from a watery grave. We shall here furnish an accurate representation and description of such boat.

Fig. 1, Is a perspective view of the boat, the body of which consists of wicker-work covered with leather, to render it impermeable by water: and so remarkably light, that it may be easily managed by one person, both on the ice and in the water. Its length, when measured on the outside, is 7½ feet in the keel, and twelve above from end to end: its breadth, 3 feet at the bottom, and 4 at the upper part.

Fig. 2, Represents the plan of the boat, the bottom of which is shod with two small pieces of iron, marked, *x x*: by means of two hooks, one of which is delineated on the plate, the boat may with the greatest facility be slided over the ice. In the lower part, or body of the vessel, there is a large opening, 3 feet long, and 15 inches wide, pointed out by *o*, *o*, *o*, fig 2: and *o*, fig. 3; the four sides of which are secured by a frame-work, marked *r*, fig. 1, and 3, to prevent the water from entering the vessel. Through this opening, also, the boatman is enabled to step upon the ice in those places where it is too uneven to admit the sliding of the boat, and to carry it, by means of the handles, as represented in fig. 1, where the person standing is marked only with dotted lines, to shew that he has quitted his former station in the boat. Another advantage derived from this aperture, in the middle of the boat, is the counterpoise which a column of water in its centre produces, and thus prevents it from being overset, while the man who carried it over the ice, immediately raises himself above the level of the water, and sits down in the vessel. But, in order to approach nearer to the person whose life is endangered, there is also employed a ladder with a long jointed handle, which is pushed forward and held by another assistant standing on the firm ice. On this ladder (which will be delineated among the implements of restoration from DROWNING) the boatman places himself, and advances as near as possible to the body immersed in the water. Having successfully extracted it, no time should be lost in laying it in a proper posture in the boat; which for purpose there is a kind of a chair with an elevated back, on the stern of the boat, marked *n*, in fig 1, and 3: which last exhibits the longitudinal section of the vessel.

Mr. GUNTHER, one of the most active members of the *Hamburgh Society for the Encouragement of the Arts and useful Trades*, informs us in the third volume of their Transactions, published in 1795, that he has often been present when unfortunate persons have been rescued from untimely death, by means of the ice-boat, and that the swiftness and dexterity with which this

machine may be managed by expert assistants, is almost incredible. Hence the vessel is not intrusted to any but skilful hands, and during summer it is deposited in an airy place, and the leather preserved from becoming either too dry or mouldy. The whole of this useful apparatus costs only 150 marks currency, or about 10*l.* sterling; a sum so insignificant, that, while the city of Hamburgh has built five such ice-boats, the great city of London ought to be in possession of at least one hundred.

A patent has lately been granted to Mr. Edward Steers, of the Inner Temple, for a machine to be applied to boats and other vessels, for the purpose of moving them with ease and swiftness. This invention consists of two or more paddles, moving by means of machinery, in contrary and alternate directions. The paddles are so constructed, that when the machinery is set in motion, the broad surface of one or more of them will press against the water, while the broad surface of the other, or others, will give way to it, and by this means the vessel will be moved.

BOATSWAIN, the officer who has the boats, sails, rigging, colours, anchors and cables committed to his charge. It is particularly the duty of the boatswain to direct whatever relates to the rigging of a ship, after she is equipped It is likewise his office to summon the crew to their duty; to assist with his mates in the necessary business of the ship, and to relieve the watch when it expires; he is directed by his instructions to perform his duty with as little noise as possible.

BODY, in physics, implies an extended, solid, divisible substance, which in itself has no power of motion, but acts by external impulse; it also possesses the properties of attraction and repulsion. Whatever relates to this branch of knowledge, under its various modifications and appearances, through the whole creation, is the subject of physics, or natural philosophy: if it concern the economy of the human body, in particular, and the treatment of its various disorders, it belongs to the province of medicine, or the department of the physician. In this sense, therefore, the term *body* is used in opposition to *soul*, and forms the subject of anatomical research.

Whatever tends to impart a proper tone and vigour to the body, that is, every impression which is most likely to soothe and harmonise the passions, at the same time contributes to regulate the powers of the understanding, and gives them their due force and energy. Hence, temperate gratifications, as they are highly conducive to these ends, promote the harmony of virtue; for by contributing to the health and sprightliness of the body, they invigorate the powers of the mind, and check the violence of the passions

The human body is a machine so artificially and admirably organised, for withstanding the various impressions of external agency, or the sudden vicissitudes of heat and cold, dryness and moisture, as well as for performing its various functions, that it bears evident marks of a wise and omnipotent Creator. It is composed of fluids and solids . the principal of the former are, the blood, chyle, saliva, bile, and the gastric liquor; of which the three last mentioned materially promote the digestion of food; the chief of the solids are the bones and cartilages which give firmness and attitude to the body.

It would lead us too far from the plan of this work, to enter into particulars respecting the complicated and wonderful structure of the human frame: we shall therefore, only observe, that it ceases to grow in height when the bones arrive at a certain degree of firmness and rigidity, which will not admit of farther extension by the motion of the blood. This period appears to take place between the age of eighteen and twenty-four; but in females, often one or two years earlier than in males. Lastly, it is remarkable, that the height or length of the human body varies at different parts of the day: thus, in the morning after a long and refreshing sleep, an adult will be found one inch taller than he was in the preceding evening.

Body, in geometry, is a figure conceived to be extended in all directions, or what is usually said to consist of length, breadth, and thickness; being otherwise called a solid. A body is conceived to be formed or generated by the motion of a surface, like as a surface by the motion of a line, and a line by the motion of a point.—Similar bodies, or solids, are in proportion to each other, as the cube, of their like sides, or linear dimensions.

Bodies, (Regular or Platonic,) are

those which have all their sides, angles, and places, similar and equal.

Of these there are only 5; viz. the tetraedron, contained by 4 equilateral triangles; the hexaedron or cube, by 6 squares; the octaedron, by 8 triangles; the dodecaedron, by 12 pentagons; and the icosaedron, by 20 triangles. To find the superfices or solidity of the regular bodies,

1. Multiply the proper tabular area (taken from the following table) by the square of the linear edge of the solid, for the superfices.

2. Multiply the tabular solidity by the cube of the linear edge, for the solid content.

Table of the Surfaces and Solidities of the five Regular Bodies, the linear edge being 1.

No. of Faces.	Names.	Surfaces	Solidities.
4	Tetraedron	1·73205	0·11785
6	Hexaedron	6·00000	1·00000
8	Octaedron	3·46410	0·47140
12	Dodecaedron	20·64573	7·66312
20	Icosaedron	8·66025	2·18169

BOG, a quagmire covered with grass, but not firm enough to support a heavy body.

Various theories have been started to account for the formation of bogs; but the most probable is, that they have originated from the roots of trees, and other decayed vegetables. Under some bogs of considerable depth, are to be seen the furrows of land once ploughed. The black bog is a solid, weighty substance, which cuts like butter, and is similar to rotten wood; but the red bog is of a lighter texture, though under it there is commonly a solid black stratum, which makes good fuel. Sound trees are found in both sort of bogs, particularly in those of Ireland, which differ from the English, as the former sometimes present a perfect scenery of hill and dale, while the latter are mostly of a level surface. Of the most common spontaneous growth are, heath, bog-myrtle, rushes and sedgy grass. Bogs are of various depths, some being found to be fifty feet deep, and others still deeper. A good method of draining boggy lands is, by deep trenches partly filled with stones, and covered with thorns and straw. A quantity of hard, dry earths, such as gravels, sands, chalks, stones, &c. is of great use in the improvement of bogs, as these substances serve to bind, fatten, and warm the soil, while they prevent springs from oozing up and overflowing the surface. By this method, boggy or marshy grounds may be improved so as to produce good grass. See SWAMP-DRAIN.

BOHEA, a species of tea. See TEA.

BOILERS. Many ingenious vessels and utensils have, at different periods, been invented, with a view to facilitate the process of boiling, and save the consumption of fuel. In the latter respect, Count RUMFORD stands at the head of those experimental inquirers, who have directed their labours to the benefit of society; yet we must confess that there is still great room for improvement. One of the latest inventions in this department of domestic economy is that of MR. THO. ROWNTREE, engine-maker, of Great Surry-street, Blackfriars-road (London,) who in 1798, obtained a patent for "a new method of applying fire for the purpose of heating boilers and other vessels, where heat is required." But as the patentee had not given a clear specification, from which an ordinary tradesman could have constructed a furnace on his principles, without any farther explanation, his patent was declared void, after a trial before Lord ELDON and a special jury, on the 3d of November last, and has consequently become public property. These proceedings, however, have been attended with a good effect, as the obscure account published by Mr. ROWNTREE, has been more clearly defined by the evidence given in Court, especially by that of Mr. HINDMARSH. We shall, therefore, present our readers with the specification communicated by the patentee, and accompany it with the necessary illustrations. The following is a literal abstract of the inventor's description. "For heating of coppers, boilers, furnaces, ovens, and stoves, my fire-place is much smaller than heretofore made use of for the same sized copper, boiler, furnace, oven, or stove. Instead of placing my fire-place, according to the common practice, immediately under the boiler, or other vessel, I place it at the front, side or end, as I see most convenient, in such a manner as to oblige the flame to rise in the front, side or end, and pass all round the vessel, &c. while at the same time it strikes the bottom of the vessel, &c. without suffering the flame to pass off in a flue, or flues, as it usually does in the common way, and by that means sending the heat into the flues, instead of its being used where it ought to be, namely, on the vessels, &c. This, my method effectually

prevents, for, by means of a small perpendicular, or other opening, into a box or trap, which I call a reservoir, and which I place horizontally, or diagonally, as the situation may require, and is made of iron, brick, stone, or any other material capable of bearing heat, where a valve is placed riding on centres or otherwise, and standing in a diagonal or other direction, as is found most convenient, the flame is returned or impeded in its progress to the chimney, and made to descend below the bottom of the vessel, and pass out at the bottom, top or side of said box, trap, or reservoir, into the common chimney. This reservoir is placed between the vessel, &c and the chimney. To the opening which admits the flame into the reservoir, are affixed, when necessary, sliders, registers, or stops, which serve to increase or diminish the heat. The valve in the reservoir is for the same purpose in another degree, which more immediately appertains to increasing or diminishing the draught, which it does by moving the said valve into different positions, as the speed of the operation may require."

It would be needless to state the particulars of the evidence relative to the effect produced by the new invented furnaces, in heating boilers, &c. as well as the great saving of fuel, which was proved to be more than *one-third*, and in some cases nearly *one-half*, of what is usually consumed in furnaces constructed on the old plan. Hence we shall communicate only the substance of Mr. HINDMARSH's evidence, which greatly tends to illustrate the principles of the invention. This, he conceives, principally consists in the three following circumstances:

1 In the peculiar mode of constructing the furnace, or setting the boiler, and of placing the fire, not immediately under, but a little in front, or at one side of it, whereby the flame and hot air can get access to every part of the vessel, and not only strike with force against its bottom, but also with equal effect reverberate against, and violently embrace its sides, and whole external surface; unlike every former contrivance, the most perfect of which could only cause the flame and hot air to act partially upon the bottom and sides of the vessel.

2. In the elevated situation, and smallness of the aperture leading from the furnace towards the chimney; whereby the flame and hot air are impeded in their progress to the atmosphere, and compelled to tarry in the cavity of the furnace, and occupy every part thereof much longer than they otherwise would do. This effect in stopping, checking, and as it were arresting the flame and hot air, in their attempt to escape into the atmosphere, Mr HINDMARSH considered as not only new, but singularly beneficial; for, by this means, the flame and hot air are detained in the very place where their presence is most wanted, and constrained to give forth their energies with an *impetus* against the bottom and sides of the vessel to be heated: whereas, in none of the furnaces heretofore erected, was any effectual stop interposed between the fire and the chimney, to cause the flame and hot air to dwell under and round the sides of the vessel, but they passed rapidly off into the atmosphere, either by a direct communication through the chimney, or indirectly, but almost as speedily by flues; or else by a drain (as it is called) the aperture of which is equal in dimensions to that of the chimney itself.

3. In an open space between the furnace and chimney, called by the patentee, a box, trap, or reservoir, and intended as a receptacle of the flame, hot air, and smoke, after they have quitted the furnace, and passed through the small aperture as above described. This space, or reservoir, for the flame, hot air, and smoke, being closed at the top and external sides, and open only at the bottom outwards, for the purpose of permitting the smoke, &c. to pass off into the chimney, still farther checks and detains the flame and hot air in the furnace. and being itself constantly full of warm air, smoke, &c. causes the heat to be reverberated against the sides and bottom of the vessel or boiler, and effectually prevents the admission of the cold atmospheric air from the chimney, which, on the old plans of construction, is found by experience to rob the furnace and vessel of more than half the supply of heat which any given quantity of fuel is capable of yielding The valves, sliders, and dampers, are not essential parts of the invention, but merely as regulators, which, in many cases may be altogether omitted, without detriment to the operation of the fire.

Although Count RUMFORD has successfully extended his researches to discover the most economical plan in the management of fire, and the generation of heat for culinary and other purposes, it does not appear from his writ-

ings, that he had a distinct conception of the new method suggested by Mr. ROWNTREE, till after the enrolment of his specification in May, 179. Nay, says Mr. HINDMARSH, the Count evidently takes it for granted (see vol. II. p. 23 of his Essays) and even reasons on the fact, which he there supposes to be unavoidable, and beyond remedy, that the fire cannot be made to impinge against the sides of a vessel with the same force and effect as against the bottom; which is a plain proof, that at the time of writing that essay, he was totally unacquainted with Mr. ROWNTREE'S method of applying and managing the fire; in which the very effect which the Count considers as a *desideratum* in science, and which appears to have been one grand object of his philosophical pursuits, is now in a great measure completed. See KITCHEN.

[The strongest form of a large boiler is a cylinder, which is strong as its diameter is small. No flue ought to go through it. The best material, sheet-iron Boilers for brewers or distillers ought to have an arch or a platform between the fire and the boiler, so that the uncombined, unconsumed oxygen of the air may not be permitted to strike immediately against the heated copper. —T C.]

BOILING, or Ebullition, the bubbling up of any fluid. The term is most commonly applied to that bubbling which happens by the application of caloric, though that which ensues on the mixture of an acid and alkali is sometimes also distinguished by the same name. Boiling, in general, is occasioned by the discharge of an elastic fluid through that which is said to boil; and the appearance is the same, whether it is common air, fixed air, or steam, that makes its way through the fluid The boiling of water is occasioned by the lowermost particles being rarefied into vapour by reason of the vicinity of the bottom of the containing vessel to fire. In consequence of this, being greatly inferior in specific gravity to the surrounding fluid, they ascend with great velocity, and, agitating the body of water in their ascent, give it the tumultuous motion called boiling.

Every particular liquid has a fixed point at which boiling commences, and this is called the boiling point of the liquid Thus water begins to boil when heated to 212 degrees After a liquid has begun to boil, it never becomes hotter, however strong the fire may be to which it is exposed A strong heat, indeed, makes it boil more rapidly, but does not increase its temperature. This fact was first observed by Dr. HOOKE. The following table shows the boiling point of a number of liquids:

Bodies.	*Boiling point.*
Æther - - -	98
Ammonia - -	140
Alcohol - - -	176
Water - - -	212
Muriate of lime -	230
Nitric acid - -	248
Sulphuric acid -	590
Phosphorus - -	554
Oil of turpentine -	560
Sulphur - -	570
Linseed oil - -	600
Mercury - -	660

The boiling point however is found to depend on the degree of pressure to which the liquid is exposed. If the pressure is diminished, the liquid boils at a lower temperature, if it is increased, a higher temperature is necessary to produce ebullition From the experiments of professor Robison, it appears that, in a vacuum, all liquids boil about 145 degrees lower than in open air, under a pressure of 30 inches of mercury; therefore water would boil in vacuo at 67 degrees, and alcohol at 34 degrees. In Papin's digester, the temperature of water may be raised to 300 degrees. or even 400 degrees, without ebullition; but the instant that this pressure is removed, the boiling commences with prodigious violence.

BOILING, in the culinary art, is a method of dressing animal food, vegetables, &c. by decoction in hot water, for the purpose of removing their natural crudities, and rendering them more easy of digestion. By too much boiling, however, flesh is deprived of a considerable part of its nourishing juice, as the gelatinous substance of the meat is extracted, and incorporated with the water, while the spirituous and balsamic particles are dissipated by evaporation. The culinary process of *stewing* is more profitable, especially if conducted in close vessels, as it is better calculated to preserve and concentrate the most substantial and nutritious parts of animal food.

BOLES, are viscid earths more friable than clay: they are soft and unctuous, and gradually melt in the mouth, communicating a slight sensation of astringency There is a great variety of these earths, which have been recommended as astringent, sudorific and alexipharmic, but without sufficient

grounds. They are still prescribed in fluxes, and complaints of the first passages.

BOLOGNA PHOSPHORUS, or *Bononian Stone*, a very remarkable kind of sulphate of barytes, has its name from being found near Bologna in Italy. This substance, when detached, is usually observed in roundish, flat kidney-shaped pieces, from about the size of a walnut to that of an orange, which have a shining and somewhat fibrous texture within. When the outer coat of this stone is washed away by heavy rains, it has sometimes the appearance of burnished silver. An Italian shoemaker, in the year 1630, deceived by this appearance, carried home several pieces, hoping by means of fire to extract silver from them. But at the same time that he was disappointed in this expectation, he was surprised by a very unlooked for phenomenon. All the pieces which he had thus attempted to melt, when they were afterwards exposed to the light, became themselves luminous. It is the singular property of the Bologna stone, after it has undergone calcination in a particular manner, to become capable of imbibing so much light on exposure for a little while to the light of the day, or even to the flame of a candle, that it will afterwards shine in the dark for an interval of from eight to fifteen minutes, like a glowing coal, but without any sensible heat. The light which it emits is sufficient to read by, provided the letters be placed near it. If well prepared the stone will retain this extraordinary property for five or six years.

BOMB, a large shell of cast iron, filled with a cement compounded of quicklime, ashes, brick-dust, and steel filings, worked together in a glutinous water or prepared liquid. The shell has a vent, by which a fusee is introduced, which is so calculated, as that, being lit previous to the discharge of the bomb, it shall communicate with the contents about the time of its descent. The bomb is thus contrived to annoy the enemy, partly by the weight with which it falls, but more by the destruction it may scatter in bursting.

BOMB-VESSEL, small ships, adapted to throwing bombs into fortresses on the sea-shore. They are said to have been first used at the siege of Algiers, before which enterprise it was never thought practicable to carry on a bombardment from the sea.

BOMBASINE, a name given to two sorts of stuff; the one of silk, and the other crossed with fine worsted.

BOMBAST, in composition, is an endeavour, by strained and turgid description, to give a low or familiar subject that importance of which it is not susceptible; instead, therefore, of being sublime, it always proves ridiculous. The style of a writer, who has no real genius or talent for description, is extremely prone to deviate into bombast, and vitiate the taste of others. Hence, books written in a redundant or affected style, ought never to be entrusted to the hands of youth, who are more apt to listen to and imitate the language which is addressed to the imagination and the senses, than the serious and dignified admonitions which are supported by reason and experience.

BONES, are solid substances composed of animal earth and gluten. They support and form the stature of the body, defend its viscera, and give adhesion to the muscles. Their number in the human frame is generally 240, but in some individuals, who have two additional bones in each thumb and great toe, they amount to 248. The regular division of them is as follows: 63 bones of the head, including the 32 teeth, 53 of the trunk: 64 of the upper, and 60 of the lower extremities.

One of the most remarkable diseases of animal bones, is their occasional softness and reduction in the living body; of which there are several well authenticated instances. The late Mr. Gooch, a respectable surgeon of London, relates the case of a woman naturally five feet six inches high, who was gradually reduced down to three feet four inches. In ricketty children, the bones are obviously softer than they ought to be in a sound state, owing perhaps to their erosion, occasioned by the discharge of an acrimonious humour. In a similar manner, the scurvy has often been remarked to affect these solid parts of the human frame. Hence, in the former instances, attention to a proper diet, gentle friction with coarse cloths, exercise, fresh air, and cold bathing, will frequently change the constitution of such children, insomuch, that at the age of twenty, there will not remain the least symptom of their former debility.

It is generally believed, that the bones, in a healthy state, are insensible to pain, because the larger ones are unconnected with any nerve: hence the operation of the trepan has been performed upon sound persons who were not under the influence of opium, without giving them any additional pain

during the perforation of the skull. See FRACTURES and TEETH.

Decomposition of Bones. After being separated from the animal, they may be hardened and softened, both by acids and alkalies, according to the quantity of saline matter employed, and the manner in which it is applied. The most effectual and cheapest method of reducing the hardest bones to a soft pap or jelly, is that effected by the action of simple water, heated in what is called *Papin's Digester;* a machine consisting of a strong and close iron vessel, in which the steam of boiling liquors is confined, and thus a more intense degree of heat is produced than any fluid could otherwise acquire. This effect, however, may be accomplished in a much shorter time, when, instead of pure water, alkaline solutions are employed; yet the latter could not properly be used in any culinary process.

If bones be exposed to a moderate fire, either in open vessels, or in contact with the burning fuel, they become opaque, white, and friable: by increasing the fire, they are still more reduced, and easily crumble into powder. But, if they be at first submitted to an intense heat, such as is required to melt copper or iron, they become firm, semi transparent, and sonorous, not unlike hard mineral stones This curious experiment deserves the farther researches of the chemist.

If bones reduced to powder between a pair of toothed iron cylinders, are boiled in eight or ten times their weight of water, for the space of three or four hours, or till about half the water is wasted, the liquor will be found on cooling of a gelatinous consistence A vessel with a tight cover should be used that the water may acquire as much heat as possible, and it should not be of copper, as this metal is easily dissolved by animal mucilage.

Bones from different parts, afford different proportions of jelly. According to the experiments of Professor PROUST of Madrid, five pounds of the middle part of the bone of a leg of beef, will afford nine pints of jelly: the same quantity of the bone of the joint, fifteen pints; of the ribs and spine, eleven quarts, of the rump and edgebone, thirteen quarts. Five pounds of mutton bones, of every sort together, give nineteen pints of jelly. Pig bones yield a little more. To Mr PROUST's taste, the jelly from pig bones was the most agreeable of all: that from mutton had the flavour of the meat Of the jellies from beef bones, that from the ribs was most pleasing, both to the sight and palate, that from the leg and joint least. In warm weather the liquor must be boiled down somewhat more, if it be intended to assume the same gelatinous consistence when cold; as the same quantity of bone that would afford a quart of jelly in winter, will not yield above a pint and a half in summer, but then it contains proportionably more nourishment. If this jelly be boiled till it acquires a consistence a little thicker than a syrup, then poured out into plates, and, when cold, cut into pieces, and dried on a net, it will keep a long time, and be particularly useful at sea One ounce of this dry portable jelly, being soaked in water for a quarter of an hour, to soften it, and then boiled, will make from a pint and a quarter to a quart of jelly, equally good as that which is fresh extracted

Mr PROUST prepares a very pleasent restorative for the sick, by adding an ounce and a half of sugar, and a little salt, to fourteen or fifteen ounces of the jelly, and then making it into an emulsion, with twelve sweet, and four bitter, almonds, and a little orange peel.

Colouring of bones. This process may be performed either by immersing bones in the common dyeing liquors made of animal and vegetable substances, or staining them without heat, by different metallic solutions. To succeed in the former method, the bones should previously be boiled in a solution of alum, and afterwards steeped in a decoction made of any colouring substance Thus, for instance, to stain them a red colour, half a pound of Brazil wood may be boiled for an hour in a gallon of water, in which the bones are suffered to lie till they acquire a proper colour: if they assume too deep a hue of purple, it will be necessary to plunge them into a solution of alum, which has the effect of bringing them to a crimson or scarlet shade.

By metallic solutions, bones may be easily spotted or variegated Thus a solution of silver in *aqua-fortis*, imparts, according to its strength, a brown or black colour; a solution of gold in *aqua-regia*, or in spirit of salt, a fine purple; a solution of copper in the acetous acid, a pleasant green; and solutions of the same metal in the volatile spirit of ammonia, at first a deep and

beautiful blue; but which, on exposing it to he air, changes into a green, or blueish green. On touching the bone with the two solutions first mentioned, it acquires the desired tint in a few hours, when placed in the open air; but in those liquors made with copper, it should be steeped for at least twenty-four hours, sufficiently to imbibe the colour. In such cases as require immersion for some time, the bone may be variegated, by covering those parts which are intended to remain white, with wax, or other matter not soluble in the staining liquor

Bones are very useful articles for making different kinds of toys, and also in several of the chemical arts, as for making cast iron malleable, for absorbing the sulphur of sulphurous ores, for forming tests and coppels, or vessels for refining gold and silver with lead; for burnt bones compose a mass of a porous texture, which absorbs vitrified lead and other metals, while the unvitrescible gold and silver remain entire behind They are used for the preparation of milky glasses and porcelains, for the rectification of volatile salts, and of empyreumatic oils, and for making glue. The bones of different animals are not equally fit for different uses. The bone of the cuttle fish is used by gold-smiths for making moulds; those of bullocks for painters' black; also, in lieu of ivory, for toys and cutlers work. But the most important and beneficial uses, to which bones may be rendered subservient, are those in *rural economy*

Bones are an excellent manure, though not generally known; they should, however, not be calcined, as the animal matter will be dissipated by the fire. A St. Leger, Esq had once laid down to grass a large piece of very indifferent limestone land, with a crop of corn; and from this uniformly well-dressed piece he selected three rods of equal quality with the rest, and manured them with bones broken very small, at the rate of sixty bushels per acre. Upon the land thus managed, the crop was infinitely superior to the rest. The next year's grass was also more luxuriant, and has continued to preserve the same superiority for at least eight years, insomuch, that in spring it is green three weeks before the rest of the field He also dressed two acres with bones, in two different fields prepared for turnips, at sixty bushels to the acre, and found the crops incomparably more productive than the others managed in the common way. Upon grass-lands, he observed, that this kind of manure exerts its influence more powerfully in the second year than in the first. For whatever soil it be intended, the bones should be well broken, before they can be equally spread upon the land. No pieces should exceed the size of small marbles. To perform this necessary operation, he recommends the bones to be sufficiently bruised, by putting them under a circular stone, which, being moved round upon its edge by means of a horse, in the manner tanners grind their bark, will very expeditiously effect the purpose. Although bones of all kinds may be used with advantage, yet those of fat cattle are doubtless the best; but unground bones should never be employed, as they are of little or no service to the soil. A. St. Leger has also found it very beneficial to mix ashes with the bones: a cart-load of the former being put to thirty or forty bushels of the latter, and heated for twenty four hours (which may be known by the smoking of the heap,) the whole should be turned. After lying ten days longer, this excellent manure will be fit for use. Lastly, Dr. Hunter remarks, that the best method of grinding bones, is that between two cast metal cylinders. And as mills are very rarely erected purposely for this operation, the apparatus may be added to any common water-mill, at a very trifling expense.

Bones (*Analysis of.*) As chemistry is inexhaustible in its objects, so it is indefatigable in its researches, and especially within the last fifty years has laid, as it were, all nature under tribute. Hence the bones of various animals, and even those of man himself, have been subjected to experiment. Many of the products afforded by the combustion and distillation of bone, such as bone-ash, lamp black, ammonia, &c. have been long known, and employed in the arts From the analysis of bones we learn that, although the proportion of ingredients varies in the bones of different animals, the general constituents of bone are as follow: 1. Gelatine, soluble by boiling rasped or bruised bones in water, and giving a fine clear jelly; 2 Oil or fat, separating during the boiling, by rising to the top of the water, and when cold concreting into a suet; 3. Phosphate of lime, soluble in dilute nitrous, muriatic, or acetous acid, and precipitable thence by pure ammonia; 4. Some sulphate of

lime; 5. A little carbonate of lime; and, 6 A membranous or cartilaginous substance, retaining the form of the bone after every thing else has been extracted by water and an acid Of these ingredients the phosphate of lime exists in far the greatest abundance, amounting in different bones to between 52 and 85 5 parts in 100 of the whole. To the gelatine is owing the property which bones are well known to possess of contributing to the richness of soups, and even, when properly boiled, of making soup by themselves.

[Bones bruised, digested for ten days in dilute marine acid, (See 2d No. of SILLIMAN's Mineralogical Journal,) and then washed with cold water, leaves a nutritious gelatinous substance, that forms a considerable part of the weight of bones: or the jelly may be dissolved by boiling, and strained. Bones contain 50 parts dissolvable in boiling water: 37 phosphate of lime: 10 carbonate of lime; 3 phosphate of magnesia.—T. C.]

On the Alimentary Matter procured from Bones; extracted from "THOMSON's Annals of Philosophy," for Feb. 1818.

"In consequence of the scarcity of provisions which prevailed in Geneva, as well as in so many other parts of Europe, during the last year, the attention of the inhabitants was forcibly directed to the various methods of procuring food, and among others, to the nutriment supposed to be contained in bones. A series of experiments on this subject was published some time ago, by PROUST, and more lately by CADET DE VAUX; but the results which they obtained, were not confirmed by some trials that were made in this country, and seem to have been scarcely credited. The society for the promotion of the arts, at Geneva, appears, however, to have been more successful; they have actually employed this method of providing food to a considerable extent; and have published a detail of their processes in the Bibliotheque Universale, for September last, from which the following account is extracted:

'There are two distinct processes to which the bones are subjected; one by which, what is called the "Gelee," is obtained from them; and the other a complicated operation by which the "gelatine," is procured In the first operation, the bones are well washed, and are then broken into small fragments, with a mallet, on a hollow block;—they are then boiled in a common vessel for three hours; no compression is employed, nor is the water raised above the boiling point; one-sixth part of its weight of bones is added to the water; and during the process, the fat which rises to the surface, is skimmed off, and afterwards added to the product. By this means a jelly is procured, which is generally strong enough to become concrete on cooling. The bones may be boiled again, three successive times, and still furnish a considerable quantity of jelly; by four boilings of three or four hours each, one pound of bones will furnish four pounds of jelly, which is supposed to contain as much nutritive matter as common soup made from six pounds of meat.

'In order to preserve the bones, when they are collected in large quantity, and during warm weather, after having been washed and broken, they are to be boiled in water for half an hour, in order to deprive them of the fat and marrow which they contain; they are then boiled for half an hour in a caustic alkaline ley, and after being well dried in the open air, they may be preserved for years, if they are kept dry. The alkaline liquor is made by adding 1½ lb. of common potash, and the same quantity of quicklime to 50 lbs. of water; the clear fluid, when drawn off, is sufficient for 100 lbs of bones.

'In the second process, to procure what is termed the "gelatine," the process that has been described above is to be employed in the first instance, to extract all the parts that are soluble by boiling, after which the bones are in a proper state for this process; old bones, however dry they may appear, are equally proper for it. The object of it is stated to be, not to procure "gelee," but the proper "gelatine," which is chemically united to the phosphate of lime. The agent employed is diluted muriatic acid; 100 lb. of the bones require 50 lb. of acid, and 50 of water; the digestion is to be continued for three weeks, at a temperature of about 65° The bones, by this process, are deprived of all their earthy matter; they are then well washed for twenty-four hours; the outside membrane of the bones is pared off, and serves for the making of glue. The remainder of the bones is then dried in the open air; it consists entirely of the compact "gelatine," and, if kept dry, may be preserved for an indefinite length of time, without undergoing any alteration. About one-fourth of the weight of the entire bone, consists of this "gela-

tine;" by being emaciated for some hours in tepid water, and afterwards boiled over a slow fire, it is dissolved, and composes a highly nutritive soup. It is estimated that one ounce of the dry "gelatine," is equally nutritious with one pound of meat.'

"The minuteness with which the processes are detailed, scarcely permits us to doubt of their general accuracy, so far as respects the quantity of animal matter that may be procured from bones. Our readers must, however, be aware of the want of correctness in the terms that are employed by the committee, in describing the products that are obtained. The terms of "gelee," and "gelatine," are really synonymous; the "gelee," of the first process, when freed from the fat, and other extraneous substances, is the only real jelly; while the "gelatine," of the second process is albumen, a substance different from jelly, which, as Mr. HATCHETT has shown, composes the proper animal matter of the bones"

[Bones, burnt and pulverised, are used to make tests, in which lead is melted and oxyded by means of a current of air, and by that means converted into glass of lead or litharge, and the silver remains behind. Bones thus pulverised and calcined, furnish phosphoric acid. To 100 lbs. weight of the burnt bones, add 40 lbs. of strong oil of vitriol, and then add, by degrees, an equal quantity of water, or so much as will make the whole mass a thin paste. Stir frequently, for three or four days, then wash away the supernatant liquor, which is phosphoric acid, holding in solution some sulphate of lime. Evaporate, decant, and concentrate till you procure a dry glass: this distilled with charcoal will yield phosphorus.—T. C.]

The following account of an economical method of obtaining gelatine from bones, as practised in Paris, was communicated to the editor of the "American Journal of Science," by Mr. ISAAC DOOLITTLE, in a letter dated Paris, 16th May, 1818.

"A few days since I visited the very interesting establishment of M ROBERT, for the extraction of the gelatinous matter from bones. The bones used for this purpose are those only which answered no useful purpose (except for the fabrication of phosphorus or ammoniac) before this discovery, such as those of the head, the ribs, &c. &c. the legs of sheep and calves, &c. Those formerly used by *toysmen* (*Tabletiers*) are still used for that purpose, after extracting so much of the gelatine as can be done by ebullition.

When the heads of oxen are to be operated upon, they begin by extracting the teeth, (these are reserved for the fabrication of ammoniac, as affording a greater proportion of that alkali than any of the other bones,) they then break the skull, in such manner as to preserve all the compact parts in as regular forms as possible; these pieces present a surface of 20 to 30 square inches, and are put to soak in a mixture of muriatic acid and water. The muriatic acid used bears about 23 degrees of the *aerometre*, and is diluted by water to about 6 degrees—four parts of the liquor is used to one part of bones. They are left in this state, in open vessels, until a complete solution of the phosphate of lime has taken place, and the gelatinous part of the bone remains in its original shape and size, and is perfectly supple. When this operation is finished, which commonly lasts six or eight days, the gelatine is put into baskets, being first drained and immersed a short time in boiling water, in order to extract any small remains of grease, which would deteriorate the gelatine, and also to extract any of the acid which might be lodged in the pores. It is then carefully wiped with clean linen, and afterward washed in copious streams of cold water, to whiten it, and render it more transparent; it is then put to dry in the shade.

Two ounces of this gelatine are said to be equal to three pounds of beef in making soup—that is, three pounds of beef and two ounces of gelatine will make as much soup, and of as good quality, as six pounds of beef. It is constantly used in some of the hospitals of the capital, particularly in the lying-in hospital.

The ends of the bones, and such parts as from their porosity might still retain a portion of the acid, are separated, and used for making glue of a very superior quality

The inside of the bones of sheep's legs furnish a sort of membranous glue, which supplies, with advantage, the place of isinglass in the fabrication of silk stuffs.

I give you these particulars, not because I think they contain any thing new to you, *in principle*, but because I may have hit upon some *details* with which you were unacquainted"

[*Uses of a Dead Horse.*—We have a tolerably good poem on the life and

death of a blood horse, "The high mettled racer," tracing his progress from being the favourite of the turf, through all the grades of hardships, till he is worn out with hunger, labour and blows, in the cart of the scavenger; I fear, a faithful account, not much to the credit of British humanity. I will now trace the progress of a *dead horse* through all the stages of his posthumous utility, greatly to the credit of the skill and frugality of that most ingenious people, as economical manufacturers. When a gentleman's horse dies, the routine of disposing of the dead animal, is this. He is sent to the sadler, who gives credit for him at a guinea. The sadler gives notice to the currier, who has the horse conveyed to some repository for dead horses, where he is skinned, and the currier takes away the skin, leaving the carcass. The skin is depiled by lime, drest and tanned in the usual way: the offal of the skin cut off by the currier is sold to the glue maker. the offal of the leather during the process or after tanning, is laid by and sold to the makers of snuff-boxes, &c.

The dead horse, is a subject for dissection to young students in comparative anatomy, who pay for the licence of going to the repository, a guinea a quarter. The flesh is then cut off, boiled, and sold to people who hawk it about the streets of London in wheelbarrows, as cat's meat and dog's meat, at 1½ *d* per lb.

The hoofs, are sold to the makers of Prussian blue. The bones, are sold to two descriptions of manufacturers: 1st, to the makers of cart grease, who reside at the outskirts of London, and boil the bones for the sake of the fat and marrow; which, when cold, is skimmed off, and mixed with an equal quantity of tar to make the composition necessary to grease carriage wheels. Or, 2dly, they are sold to the manufacturers of volatile alkali, who make spirit of hartshorn and sal ammoniac, out of them, by distilling in large iron cylinders. The bones, thus boiled down, used, in my time, to be sent back again to a steam mill near St. John's, Clerkenwell, where they were ground into a coarse powder, and sold as a top dressing for grain crops.—T. C.]

BONE SPAVIN, is a bony excrescence, or hard swelling, on the inside of a horse's leg. A spavin, which begins on the lower part of the hock, is not so dangerous as that which grows higher between the two round processes of the leg-bone; and that which appears near the edge, is less injurious than if it were situated more towards the middle and inwards, where it would, in a greater degree, impede the bending of the knee.

A swelling occasioned by a kick or blow, is not at first the true spavin, nor so dangerous as when it proceeds from a natural cause; and that which grows on the leg of a colt, is not so inveterate as that of a horse come to maturity. In old horses, the spavin generally is incurable.

The usual method of treating this disease, is, by blisters, and the actual cautery. When a fulness on the fore part of the hock is occasioned by hard riding, or any other violence, cooling and repelling applications are proper, as in the case of bruises or strains.

Among the various prescriptions for the blistering ointment, the following by Mr Gibson, is preferable: Nerve and marsh mallow ointment, of each two ounces; quicksilver, one ounce, thoroughly mingled with one ounce of Venice turpentine; Spanish flies, powdered, a drachm and a half; sublimate, one drachm; oil of origanum, two drachms.

When the hair is cut as close as possible, the ointment is to be applied pretty thick to the injured part, in the morning, and the horse should be kept tied without any litter till night. He should then be untied, that he may lie down, and a pitch plaster fastened to the part with a proper bandage.

After the blister has done running, and the scabs begin to peel off, another may be applied, which will have a still better effect; and in young horses, will generally complete the cure. But if the spavin has been of long standing, a repetition of the blister five or six times, will perhaps be requisite. Each application must be made at intervals of a fortnight or three weeks, lest the blemish of a scar, or baldness, remain on the part.

Spavins on old or full-aged horses, as they grow more inward, and run among the sinuosities of the joint, are for the most part incurable.

In such cases, the strongest caustic blisters must be applied, or the part immediately fired; but the best and safest way to preserve the use of the limb is, by long-repeated applications of the above-mentioned blistering ointment, for some months, if necessary. The horse, in the intervals, should be exercised moderately, and by degrees

the hardness will be dissolved, and disappear.

If the spavin is deep and runs so far into the joint that no application can reach it, all medicines will be unavailing. When the disease does not penetrate the joint, and the blistering method is found ineffectual, the swelling may be safely cauterised with a thin iron, forced pretty deeply into the substance; and it should afterwards be dressed according to the foregoing directions.

BOOK, a general name for most literary compositions; but should, with propriety, be applied to such productions only as extend to the size of a volume.

The writings of MOSES are allowed to be the most ancient of any extant; but as several are cited by this author, some must undoubtedly have been written previous to his time. Next to these, the oldest with which we are acquainted are the Institutes of MENU, which Sir W. JONES considers as nearly but not quite as old as the time of MOSES. The Greek authors mention no less than seventy other writers prior to HOMER.

The materials used by the ancients instead of paper, were of various kinds, as plates of lead and copper, the bark of trees, bricks, stone, wood, &c. Instead of wooden tables, the leaves of the palm-tree were afterwards used, and the inner part of the bark of the lime, the ash, the maple, and the elm: as these could be rolled up, they received the name of *volumen*, or a volume, which appellation was afterwards transferred to similar rolls of paper or parchment.

The material next introduced for the purpose of transmitting the records of the learned to posterity, was wax; and afterwards leather, or the skins of goats and sheep, which at length were manufactured into parchment; these were succeeded by lead, linen, silk, horn, and lastly, paper. Books were first made square in the form of blocks and tables; but that of rolls was afterwards found most convenient: they were composed of several sheets fastened together, and rolled upon a stick; the whole making a kind of column, which was managed by the stick as a handle, it being considered a crime to lay hold of the roll itself. The volume, when extended, was commonly fifty yards in length, and a yard and a half wide The present form of books, consisting of separate leaves, was not unknown to the ancients, though little used by them.

With the form of books is also connected their internal economy, as the order and arrangement of lines and pages, margins, &c. These have undergone many variations. At first the letters were only divided into lines: afterwards into separate words, which by degrees were distinguished by accents, and distributed by points and stops into periods, paragraphs, chapters, and other divisions The Orientals began their lines from the right, and carried them to the left; while the Greeks wrote in both directions alternately, beginning in the one, and reversing in the other. The method of writing practised by the Chinese is still more curious, as they extend their lines from the top to the bottom of the page.

We shall conclude this article by stating a method of preserving books from the depredations of worms and insects. There is a very small insect that deposits its eggs in books during the month of August, especially on those leaves nearest the cover These gradually produce a sort of mites, similar to what are generated in cheese; and which afterwards change their state, and become beetles; and when the time of their transformation approaches, they eat their way through, till they gain the extremity of the book. The best preventive against their attacks is mineral salts, to which all insects have an aversion. Alum and green or blue vitriol, are proper for this purpose, a small quantity of which should be mixed with the paste used by book binders. Moths will not touch Russia leather.

Books are liable to be stained with grease, tallow, oil, or other fat substances, by which their beauty and value are greatly impaired; hence we shall add the following recipe for restoring them to their former colour, on the authority of M DESCHAMPS He directs ("*Bibliotheque Economique*," vol. i.) the soiled paper first to be warmed, and as much of the grease as is possible, to be taken out, by means of blotting-paper. A small brush is then to be dipped in the essential oil of well rectified spirit of turpentine, previously heated till it nearly boil, and to be drawn over both sides of the paper, which ought to be kept warm. This operation is to be repeated, till all the grease be extracted; when another brush, immersed in highly rectified spirit of wine, must be passed over the

same paper; by which expedients the spots will completely disappear; the paper will resume its original whiteness; and though the process be employed on a part containing written or printed characters, they will experience no alteration.

The common form of book-cases with fixed shelves, is attended with many inconveniences; to remedy which, the following plan will be found very useful. Two strips of wood, in which are cut teeth like those of a saw, about half an inch deep, are screwed on each side of the front, and two other corresponding pieces on the back corners of the book-case. Two cross bars, about ¾ of an inch broad, for each shelf, are then to be fitted into the teeth to support the shelves. By this contrivance, the shelves may be removed so as to fit a row of books of any size. Book cases made upon this plan are common in Philadelphia. They are from a pattern in the possession of Mr JEFFERSON.

[The following account of the paper and books of the ancients, may amuse the reader.

PAPYRUS. The ancients wrote, 1st, on smooth lead. Hesiod's poems, deposited in the temple of the Muses at Bœotia, were so written. 2dly. On boards planed smooth: on such were the laws of Solon written, in Boustrophedon lines. These were the *libri in schedis*, the common books of the Romans. 3dly. *Libri cerei*, boards planed and waxed. These were written on with an ivory or metal pointed pen; hence *stylum vertere*, one end being used for writing, the other for erasure. 4thly. *Libri lintei*, where the wooden tablet was covered with linen; on such were the Sibylline books, and some ancient laws written: sometimes I presume with atramentum; but Drummond and Walpole in their Herculanensia, Diss. 7th, say the linen was waxed 5thly *Libri in coria*, mentioned by Ulpian, lib. 52. were such, as had an under layer of leather, to prevent the transparency of the first layer: as I think from the description in 13 Plin. 12. 6thly. The *membrana*, which I also suspect to be a kind not so well dressed as, 7thly the *pergamena carta*, which approached our parchment: a manufacture promoted by Eumenes king of Pergamus. 8thly Bark, paper *è cortice tæneotica*. 9thly. Coarse wrapping paper used by tradesmen, made out of coarse paper and straw, *emporetica*. 10thly. The *Papyrus*. Consistence was given to all these by size, or by paste, made of flour, or by boiling the crumb of fine bread. The membrana charta, the charta coriacea, the pergamena charta, and the charta papyri, were all liable to be moth-eaten, "aut tineas pasces taciturnus inertes." Hor. Ep 20. For the various other denominations of paper, as the *Hieratica*, or paper for religious treaties, the *Liviana*, and *Augustina*, or royal paper, the *Fanniana*, from a paper maker of that name, the *saitica*, from Sais in Egypt, *tæneotica*, the *emporetica*, &c. I refer generally to 13 Pl. 12

The charta è corio mentioned by Ulpian, I have already noticed. Justinian, whose institutes were published in the year 533 of our æra, enumerates tables, paper and dressed skins Literæ quoque licet aureæ sint, perinde chartis, membranisque cedunt 2 Inst. tit. 1 § 33 Sed si Titio petas tuos libros tuasve membranas, (qu does not this imply that the parchment was not used for books ?) Ib.

Nihil autem interest, testamentum in tabulis, an chartis, membranisve, vel in alia materia est. 2 Just. Inst tit. 10. § 12. Hence also it appears that the letters were sometimes gilt; (embossed and burnished, from whence I suspect arose the practice of illuminating missals.)

The paper books attributed to Numa, were certainly forgeries, as appears from the anachronism of their containing Pythagorean tenets 13 Pl 12.

The papyrus, whence our appellation paper, deserves further notice

The papyrus, according to Pliny, was made of the thin pellicles (phylyra) of the stem of the plant called papyrus growing in the Nile, about 10 feet high, in about 3 or 4 feet water. (Bruce has given a plate of it.) The centre coat was best When separated by a sharp pointed instrument and laid across each other at right angles, they were moistened, then pressed, and dried in the sun Generally the saccharine mucilage of the plant itself (a great part of which was an article of food) was sufficient to give an even and smooth tenacity to the pellicles thus separated, when pressed. If not, they were moistened with a kind of paste or starch made of wheat flour and vinegar; then dried, and beaten with a mallet. Sometimes with a paste made by boiling bread and straining it. The Romans under the emperors, used to polish the papyrus thus treated with smooth ivory, and subject it to rollers and presses.

In making up a book, the written paper was rolled on a stick or roller, *umbilicus:* the ends of the umbilicus *cornua* were much ornamented. So was the outside of the volume, (volumen, roll) called *frons* The title συλλαβος (whence our syllable) was then stuck on the outside. The whole volume might be about three feet wide and forty or fifty feet long, The books found at Herculaneum and Pompæi, according to the late report of the rev. Mr J Hayter, whom the Prince of Wales employed about ten years ago, to examine and unrol them, are of papyrus upon wooden rollers: the leaves are from one to three feet broad, and when unrolled extend from thirty to forty feet. He says the ink contains much gum, and no acid. Hence it should seem that they were written on by means of a reed (calamus) dipt in the atramentum librarium of Pliny, which was fine size and lamp black. It was common to insert a piece of parchment between every four or five leaves of papyrus, to support them. Much pains was taken by the paper makers and book binder: thus Horace ad librum suum. epist. 20.

Vertumnum, janumque liber spectare videris.

That is,

You will be sent to the Forum, where these statues were erected.

Scilicet ut prostes, Sosiorum pumice mundus

Polished with the pumice, and for sale at the bookstore of the Sosii.

Sometimes the leaves before writing were first polished with a tooth 13 Pl 12 For more on the subject of papyrus see 5 Herod 58. 4 Theoph. 9 13 Pl 11, 13 Drummond and Walpole's Herculanensia, Dissertation 8th. and Bruce's travels, who has given a good plate of the papyrus.

Job xxxi. 35. talks of writing a book: I think with many divines, this is a sacred drama of eastern origin If so, this book implies the use of papyrus at an early date See 1 Gog. 187.

Phylyra, 13 Pl. 11. is not only the name for the finer interior filament of the papyrus, but of the maple, the sycamore, the beech, the mulberry and the linden tree, all which were occasionally converted into paper, when sized, beaten, dried and rolled. The common paper in the time of the emperors was from nine to twelve inches square.

The papyrus paper was succeeded by paper made of cotton, or at first perhaps of silk; for although the cotton paper acquired the name of charta bombycina, yet it is highly probable, that the refuse silk was first applied to this purpose, as in China. The Indian or finer silk, was sericum (inter sericos jacet pulvillos) the inferior or Syrian silk was the bombycinum By and by, the frauds of the paper makers, substituted the byssus or cotton, but still it was sold as silk paper: till coming into common use, all the cotton paper, retained the name of charta bombycina. The papyrus continued in use at Rome from about 200 years before Christ to the end of the eleventh century, when many of the papal bulls, according to Father Mabillon, were written on papyrus. Montfaucon mentions a manuscript on this paper in the king's library at Paris of the date 1050. Parchment was also still in use at the same period —T. C.]

BOOK-KEEPING, is the art of recording mercantile transactions in a systematic manner.

A merchant's books should contain every particular which relates to his affairs; and exhibit the state of his business, the connexion of the different parts, with the amount and success of the whole Accordingly, they should be so full and regular, as to afford information in every point for which they may be consulted.

Book-keeping comprehends the following heads; the debts owing to a merchant, and those due by him to others, the goods which belonged to him, with the quantity and value sold, and those which remain in his possession; also the amount of his stock when the books were opened, together with his profits and losses, and the extent of his property at present.

The Italian method of book keeping by *double-entry*, is founded on the most universal principles, and is therefore the best in extensive and complicated mercantile transactions. Indeed, the accountant who thoroughly understands it, can with facility either adopt or invent any other form better suited to any particular business.

According to the Italian method, three principal books, namely, the waste-book, journal and ledger, are used. The waste-book, or day-book, begins with an inventory of the owner's goods, a list of debts due to him, and of the debts he owes to others; and it is continued with a clear statement of the money received or paid, and the goods bought or sold by him, &c. The

accountant's first care should be, to have nothing defective; and his second, to insert nothing superfluous in the waste-book.

The journal is a concise record of transactions compiled from the waste-book, in the same order as they stand there, but expressed in a technical style. The whole art of writing the journal depends upon the proper choice of the Drs. and Crs. Every thing received, or person accountable to us, is Dr.; and every thing delivered, or person to whom we are accountable, is Cr. On these two comprehensive rules, and their various modifications, depends the regularity of accounts. As for the more particular rules, they will readily be suggested by the judgment of the accountant.

From the journal, the different transactions are posted in the ledger. Each account is distinguished by a proper title, and articles of the same kind received and delivered, are entered on opposite sides of the same folio. For instance, money received is entered on the one side, and money paid, on the other; or goods bought on the one side, and goods sold on the other. The left hand page is called the Dr. side; the right hand page the Cr. side of the account; and the difference between the sums of the Dr. and Cr. sides, is denominated the balance.

Accounts in the ledger, are of three kinds, *personal, real,* and *fictitious.* Personal accounts are those opened for every person or company with whom the merchant has any dealings or credit; real accounts are those of property, such as ready money, goods, ships, houses, &c. and fictitious accounts are stock, together with profit and loss, and its subsidiary accounts.

The stock account contains, on the Dr. side, the amounts of the debts due by the merchant when the books were opened; and on the Cr. the amount of money, goods, &c. belonging to him; consequently the balance shews the amount of his nett stock. Profit and loss account contains every article of gain on the Cr. and of loss on the Dr. side; therefore the balance is the nett gain or loss, which is posted on the proper side of the stock account above-mentioned.

Several subsidiary accounts are opened, to shorten and methodise that of profit and loss, such as *interest account,* proper expenses, &c. These are used, or others invented, according to the nature and purposes of the business.

Accounts may be opened in the ledger, in the same order as they occur in the journal; or those of a similar kind may be placed together; the personal accounts in one part of the book, and the real accounts in another.

Besides the three principal, there are subsidiary books used by merchants of extensive connexions and business. These are, the cash-book, book of charges of merchandise, book of house-expenses, invoice-book, sales-book, bill-book, receipt-book, letter-book, and pocket-book. Some merchants also keep a memorandum-book; but the man of business cannot be restricted to these, as he will either use them, or invent others more conformable to the nature of his business.

In the year 1796, a patent was granted to Mr. Edward Thomas Jones, of Bristol, for his method or plan of detecting errors in accounts of all kinds, by which they may be adjusted in a regular and concise manner. This work is entitled, *The English System of Book-Keeping,* which requires a day book, or journal, an alphabet, and a ledger, ruled in the following manner: namely, the day-book has three columns on each page, for receiving the amount of the transactions; one column of which to receive the amount of the debits and credits, one column to receive the debits only, and another to receive the credits only; or it may be ruled with only two columns on each page, one to receive the amount of the debits, and the other the amount of the credits. There must also be on each page of the day-book, four other columns ruled, two on the left side, next the amount of the debits, and two on the right side next the amount of the credits, for receiving the letter or mark of posting, and the page of the ledger to which each amount is to be posted. The alphabet need not be ruled at all, but must contain the name of every account in the ledger, the letter that is annexed to it as a mark of posting, and the page of the ledger. The ledger must be ruled with three, four, five, or seven columns on each page, as may be most agreeable, for receiving the amounts of the different transactions entered in the day-book.

But in order to prevent any mistakes that may happen from the hurry of business in a counting house, Mr. Jones has given only *one* column for receiving the amount of every transaction, whether debits or credits, at the instant of making the entry: and, for the con-

venience of separating the debits from the credits, previous to posting, which is necessary to prevent confusion and perplexity, he has two other columns on the same page; that on the left side, into which the amount of every debit must be carefully entered, and that on the right for the amount of the credits; which columns must be cast up once a month. The column of debits and credits of itself forms one amount; the column for the debits produces a second amount; and the column of credits a third amount; which second and third amounts, added together, must exactly agree with the first amount, or the work is not done right. By this means, the man of business may obtain monthly, such a statement of his affairs, as will shew how much he owes for that month, and how much is owing to him; and the debits being added together for any given time, with the value of the stock of goods on hand, will, when the amount of the credits is subtracted therefrom, shew the profits of the trade.

The patentee's manner of examining the books kept by this method, also professedly differs from that hitherto practised, as well in expedition as in the certain accuracy which attends the process; it being only necessary to cast up the columns through the ledger debits and credits, according to the examples given, and the amount of those columns, if right, must agree with the columns in the day-book for the same corresponding space of time. These castings should take place once a month, and if the amounts do not agree, the posting must then, but not else, be called over; and when the time, whether it be one, two, three, or four months, that is allotted to each column of the ledger, is expired, the amount of each column should be put at the bottom of the first page, and carried forward to the bottom of the next, and so on to the end of the accounts; taking care that the amount in the day-book, of each month's transactions, be brought into one gross amount for the same time.

Having already enlarged upon this subject, we shall only observe, that this new system of book-keeping, however ingeniously contrived, has not met with that general approbation to which it is apparently entitled. To enforce his claim to public patronage, Mr Jones concludes the specification of his patent by asserting, that upon his plan every page will be proved in the progress of calculation, and "the balances of ten thousand ledgers could not unobservedly be taken off wrong." We give him full credit for his assertion; though it has, perhaps, by invidious rivals, been objected that his method is more complicated than the old Italian system of book keeping; which has, by experienee, been found fully adequate to the purpose of mercantile accuracy.

BOOKSELLER, one who trades in books, whether he prints them himself, or gives them to be printed by others. Among us, they are the[illegible] with bibliopolæ among the ancients, whose office was distinct from th[illegible] librarii. Petty dealers, or venders of small wares, like some with us, were more particularly denominated libelliones. At Rome, the Argiletum was the mart of books, as Paternoster-row, and St [illegible]'s Church yard, still are in London Booksellers in many places are ranked among the members of universities, and entitled to the privileges of students: as at Tubingen, Saltsburg, and Paris, where they have always been distinguished from the mechanical traders, and favoured by an exemption from divers taxes.

Formerly, the offices of bookseller and printer were united in the same persons Labbe gives a list of learned booksellers; most of whom were also authors. Of late, booksellers have drawn their business into less compass, and, leaving the labour of composing books to one set of persons, and that of printing them to another, content themselves with the gainful part; thus ministering to the republic of letters not with the head or the hand, but the purse only. In this view, they have been very important and useful agents between authors and the public; and have contributed in no small degree to the encouragement of genius and literary industry, and the diffusion of science. There are few authors who have undertaken the printing and publishing of any work likely to be transmitted to posterity, without being connected with some bookseller, or booksellers, eminent in the trade.

BOOKSELLER'S MARKS. An acquaintance with the bookseller's marks or signs, expressed on the title-pages of their books, is of some use; because many books, especially in the century before the last, have no other designation, either of printer, bookseller, or even city The anchor is the mark of Raphelengius at Leyden; and the same

with a dolphin twisted round it, of the Manutii at Venice and Rome; the Arion denotes a book printed by Oporinus at Basil; the caduceus, or pegasus, by the Wecheliuses at Paris and Francfort; the cranes, by Cramoisy: the compass, by Plantin at Antwerp; the fountain, by Vascosan at Paris; the sphere in a balance, by Janson or Blaew, at Amsterdam; the lily, by the Juntas at Venice, Florence, Lyons, and Rome; the mulberry-tree, by Morel at Paris; the olive-tree, by the Stephenses at Paris and Geneva, and the Elzeviers at Amsterdam, and Leyden; the bird between two serpents, by the Frobeniuses at Basil; the truth, by the Commelins at Heidelberg and Paris, the Saturn, by Colinæus; the printing-press, by Badius Ascensius, &c.

BOORCOLE, is a species of the *Brassica L.* and generally cultivated in the open fields like turnips, cabbages, or the turnip-rooted cabbage.

It is one of those hardy plants, the leaves of which may be cut without detriment to its growth, and will produce a new crop in the course of a month or six weeks.

According to an experiment made by Mr. Baker in the year 1763, an Irish acre of fallow ground, which was planted with boorcole, at the distance of two feet, and hoed in the Tullian method, produced plants which weighed about five pounds ten ounces each, on an average, and the whole produce of an Irish acre was 40,096 pounds.

It should be observed, that the land must be well manured, and in a high state of tillage, for the cultivation of this plant, which, if kept constantly hoed, will grow very luxuriantly, and, in the hottest weather, be infinitely more brittle in the leaves than any other cultivated in gardens, which is a certain indication of being a healthy plant. It is worthy of the attention of the farmer or grazier, on account of the rapidity of its growth, and the property of withstanding the effect of severe frosts, while it affords an excellent vegetable for the table, and may be used with advantage for feeding sheep.

Mr. Baker farther observes, that sheep should not be suffered to depasture so long upon a crop of boorcole, as to injure the stalks, because its future growth will be checked, by depriving it of the sprouting leaves.

BOOT, a cover or defence for the leg and foot, made of leather, and generally worn by horsemen. The boot is by no means a modern invention, as it was worn in the Roman army by the infantry as well as the cavalry. It was originally made of leather, but afterwards of brass or iron, that it might be proof against the sword.

There are various kinds of boots, as hunting boots, fishing boots, jack boots, &c. The fishermen of New England preserve their boots water-proof by the following composition: One pint of boiled linseed oil, half a pound of mutton-suet, six ounces of pure bees-wax, and four ounces of rosin. These ingredients are melted together over a slow fire, and the boots or shoes, when new and quite clean, are warmed, and rubbed with the composition till the leather is completely saturated

To prevent snow water from penetrating the soles of shoes or boots in the winter season, take a little bees-wax and mutton-suet, warmed in a pipkin until in a liquid state; then rub some of it slightly over the edges of the sole where the stitches are, which will repel the wet, and not in the least prevent the blacking from having the usual effect.

To preserve boot tops—Boot tops are now painted with common oil paint, made the colour of leather, with one pound of yellow soap, dissolved in six pints of water, and, while hot, mixed in one hundred weight of the paint. The soap, it is said, prevents it from cracking; the boot tops are dried in a stove. They look beautiful, and are easily cleaned, when dirty, with soap and water.

There is an improved composition for preserving leather, the good effects of which are sufficiently ascertained. One pint of drying oil, two ounces of yellow wax, two ounces of spirit of turpentine, and half an ounce of Burgundy pitch, should be carefully melted together over a slow fire. With this mixture new shoes and boots are rubbed either in the sun, or at some distance from a fire, with a sponge or brush: the operation is to be repeated as often as they become dry, until they be fully saturated. In this manner, the leather becomes impervious to wet; the shoes or boots made of it last much longer than those made of common leather; acquire such softness and pliability that they never shrivel nor grow hard or inflexible; and, in that state, are the most effectual preservatives against cold and chilblains. It is, however, necessary to remark, that shoes or boots, thus prepared, ought not to be worn till they have become perfectly

dry and elastic; as, in the contrary case, the leather will be too soft, and wear out much sooner than even the common kind.

The following composition is recommended in "*An Essay on Shooting*," Dublin edition, 1789.

Tallow, half a pound.
Hog's lard, 4 oz.
Turpentine, }
New bees wax, } 2 oz. each.
Olive oil, }

To be melted by a gentle heat and rubbed on the leather (when free from dampness) the night before the shoes or boots are wanted.

BORACIC ACID, the sedative salt of Homberg, is obtained from the mineral called borax, which consists of this acid in conjunction with soda. The acid, when separated, appears in the form of a white, scaly, glittering salt, with hexahedral scales; soft and unctuous to the touch. Its taste is bitterish, with a slight degree of acidity. It is soluble in alcohol, which it causes to burn, when set on fire, with a green flame surrounded with a white one. It is of difficult solubility in cold water, but is readily dissolved by boiling water It is not altered by exposure to the air; nor is it volatilised by fire, but by aqueous vapour it may be mechanically raised up; a strong heat fuses it into a transparent glass, which has a great tendency to dissolve the clay of the crucible. By this melting it undergoes no farther change than the loss of its water of crystallisation. This acid has no action on combustible bodies: its composition is at present unknown.

BORAGE, the Common, or *Borago officinalis*, L. It is rough, and clothed with small prickly hairs; has alternate leaves, and bears blue spreading flowers in June and July. See WITH. 230, and *Eng Bot*. 36.

The flowers of the borage are much frequented by bees, and the plant itself may be used as a culinary vegetable, or as an ingredient in lettuce-salad, to which it imparts an agreeable flavour. The whole of this plant abounds with nitrous particles, which may be easily obtained by elixation; for after evaporating the lixivium to a proper consistence, and allowing it to stand in a cool place, crystals will be formed, which deflagrate upon the fire, and possess all the properties of salt petre. This plant is much used in England, infused in what is called cool tankard, that is wine, water, lemon and sugar, with a sprig of borage, as a summer beverage.

BORAX, in chemistry, a salt produced in the mountains of Thibet, in Asia, both naturally and artificially by evaporation.

The borax imported from China is purer than that of Thibet, and is found in a natural state in small masses of irregular crystals, of a faint white colour. Beside the vitrescible earth, which is an essential principle of borax, it contains copper and the marine acid, but no traces of the vitriolic. It has also been clearly proved by experiments, that borax consists of fossil alkali, in some degree neutralised by a peculiar salt. When dissolved and crystallised, it forms small transparent masses, and the refiners have a method of shooting it into large crystals, which, however, in many respects, differ from, and are inferior to the genuine salt.

Borax is useful in metallurgy, for soldering, in the fusion of vitrifiable earths, with which it forms glass, as well as in several other chemical processes; and dyers frequently employ it for giving a gloss to silks.

Its medical properties have not been sufficiently investigated Mr. BISSET recommends a weak solution of this salt in water, for healing aphthous crusts, or the thrush in the mouth and fauces of children. A small quantity of it, powdered and mixed with sugar, is often applied for the same purpose.

We are not acquainted with a more balsamic application to sore nipples, or chapped lips and hands in frosty weather, than a few grains of borax dissolved in warm water, with the addition of a little pure honey, or sugar.

BOSHMEN, a class of Hottentots, who, like the Maroon Negroes in the West Indies, live without laws and without any discipline: they are a sort of land-pirates who have no resources but plunder Their name signifies *bush-men*, or men of the woods, and under this appellation the inhabitants of the Cape of Good Hope distinguish all those malefactors who desert from the colonies to avoid the punishment due to their crimes.

[The *Boshmen*, or *Boschesmen* form a part of the human race so peculiar, that the following being the best account yet given of them, will be acceptable.—T C.]

"In the peculiarities of this species of the human race, the Boschesman has

been confounded with the Hottentot; but the singularities of conformation ascribed to the latter, belong exclusively to the former.

The following description of the Houzewaana of le Vaillant, and the Boschesman of Barrow, is compiled from the accounts of these writers, and of M. M. Peron, and Le Sueur, in a former volume of the Journal de Phisique and in the Bulletin of the Societé Philomathique.

1. The Boschesmen, or people of the back woods, are only found in the country, north, north west, and north east of the Cape of Good Hope, in the great Karoo, the Mountains of Shewberg, and the country of Candebo. They border on the Caffres or Hottentots, with whom they are generally at war. They occupy a large tract of country.

2. They have no cities or houses: or any well characterised marks of civilisation. They live chiefly in caves, and holes in the rocks; but they herd together in kraals or villages, and hunt in packs; their arms are bows and arrows, and sticks; they have no language intelligible to, or acquirable by the European; they have no marks of religion or worship; they learn with difficulty when brought to the Cape, a few Dutch words; they have no sense of modesty, either as to their persons, or the gratification of their desires.

3 They are the most homely of the human species: their eyes are small, piercing, always in motion; their stature seldom exceeding fifty-two inches English; they have the leaden colour of the Malay, and are not so black as the Hottentots; their face appears to be all forehead, and has many characters of the monkey: they have properly no nose, their nostrils are broad but very slightly prominent above the face; their lips are very thick and projecting; their eyebrows are somewhat like the Chinese, and join, being somewhat rounded and not terminating in an angle like the European; they have hair curled, but so short as to appear at first view as if they were shaved; they are active, but not equal to the white man in strength, though hardy, and capable of bearing much fatigue.

4 Their women have not, as commonly supposed, a "tablier" or flap that covers the pudenda, but a funicular appendage attached by a strait peduncle, to the upper part of the labia pudendi, which increases in thickness as it descends, and in adults is about four inches and a half or five inches in length, covering the lower part of the labia: it is of a reddish colour, in substance like the skin of the dartos, it is somewhat like a large dependent penis, soft, extensible, wrinkled, devoid of hair, slit or bifid from about the mid length to its extremity, so that the two halves can be thrown over the labia pudendi on each side, when the female lies down. This organ is not a clitoris, it is not a disease, for it is universal among them, nor is it the effect of mechanical handling or extension; young girls have it of size proportioned to their age. It covers the urinary passage, clitoris, and part of the entrance of the vagina. The females have their thighs rather thin, but their buttocks very prominent, large, and fat, and an adipose protuberance projects from behind on each buttock, so large and prominent that the feet of their infants rest upon it These characters are lessened by commixture with men of other species, as with the Hottentots. Their breasts in the adult, swell out from the sternum, are then drawn in toward the middle, and swell out again, so as to be of the form of a calibash or gourd. On this class of the human kind, so singular as almost to excite a doubt how they are to be classed, men of science will form their own theories. It may be observed as a curious fact, that Pallas, in his "Observations on mountains" page [illegible]3 of the French translation, mentions a people of Thibet, who derive their own origin, according to their own account, from the aboriginal monkeys, to whom they are not much unlike in their general physiognomy."

BOTANY, the science of plants. It teaches their natural history and intrinsic qualities; and, to facilitate an acquaintance with these particulars, arranges all vegetables in classes, orders, and other subdivisions. This arrangement is called a system. Various systems, or plans of arrangement, have been from time to time proposed; but the sexual system of Linnæus is at present generally received. This naturalist has drawn a continued analogy between the vegetable economy and that of the animal; and has derived all his classes, orders, and genera, from the number, situation, and proportion of the parts of fructification. In twenty-four *classes*, he has comprehended every known genus and species. In considering a plant with a view to its characteristics or distinguishing features, it is divided by Linnæus into the fol

lowing parts, making so many outlines, to which the attention of the botanical observer must be directed: 1. Root; 2. Trunk; 3. Leaves; 4. Props; 5. Fructification; 6 Inflorescence. 1. The *root* consists of two parts, the *caudex* and the *radicula*. The *caudex*, or stump, is the body or knob of the root from which the trunk and branches ascend, and the fibrous roots descend, and is either solid, bulbous, or tuberous: solid, as in trees and other examples; bulbous, as in tulips, &c; tuberous, as in potatoes, &c The *radicula* is the fibrous part of the root, branching from the *caudex*. 2 The *trunk*, which includes the branches, is that part which rises immediately from the *caudex*, is either herbaceous, shrubby, or arborescent, and admits of several other distinctions, according to its shape, substance, surface, &c. 3 The *leaves* are either *simple*; as those that adhere to the branch singly, or *compound*, as when several expand from one footstalk. Leaves are farther described by various terms indicative of their form and outline. 4. The *props*, those external parts which strengthen, support, or defend, the plants on which they are found, or serve to facilitate some necessary secretion: as, the *petiolus*, or footstalk of the leaf; the *pedunculus*, or footstalk of the flower; the *stipula*, or husk, that is, the small leaves that generally surround the stalk at its divisions; the *cirrhus*, or tendril; the *pubes*, or down; the *arma*, or defensive weapon, as thorns 5 The *fructification*, or *mode* of fruit-bearing 6. The *inflorescence*, or *mode* by which the flowers are joined to the several peduncles.

The various parts of a flower are arranged under distinct heads, consisting of the "Calyx" or Empalement: the "Blossom" or Corolla: "Stamens" or Chives: "Pistils" or Pointals: "Seed Vessel" or Pericarpium, and "Seeds" or Semina. To these are to be added the "Nectary" and "Receptacle."

The Calyx is formed of one or more green or yellowish green leaves placed at a small distance from, or close to the blossom. There are different kinds of calyxes, as the perianthium or cup near the flower, in the rose:—the involucrum, remote from the flower, in umbelliferous plants, as is seen in the hemlock and carrot:—the catkin, or amentum, as in the willow or hazel:—the sheath or spatha, in the snow-drop:—the husk or gluma, in wheat, oats, and different kinds of grasses:—the veil, or calyptra, covering the fructification of some of the mosses, and resembling an extinguisher:—the curtain or volva, surrounding the stems, and attached to the pileus or cap, that spreading part which forms the top of several fungi, and covers the fructification, and which in the common mushroom covers the gills.

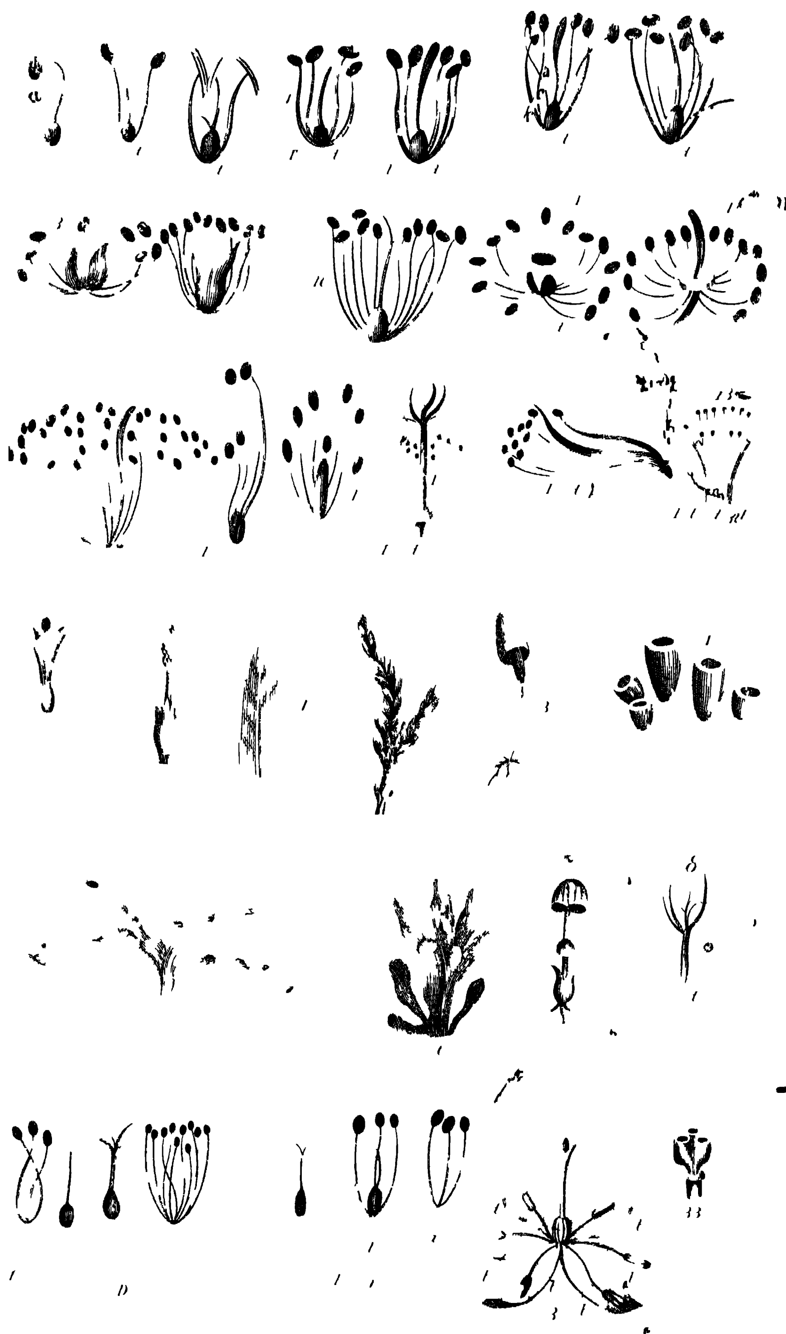
The Blossom is that beautifully coloured part of a flower, which principally attracts the attention. It is composed of one or more petals, or blossom leaves. When it is united in one, as in the Polyanthus or Auricula, it is termed a blossom of one petal; but if it be composed of many parts, it is then said to be a blossom of one, two, three, or many petals.

The Stamens are slender thread-like substances, generally placed within the blossom, and surrounding the Pistils It is composed of two parts, the Filament or Thread, and the Anther or Tip, but the latter is the essential.

A Pistil consists of three divisions, the Germen or Seed-bud, the Style or Shaft, and the Summit or Stigma; but the second is often wanting. Some flowers have only one Pistil: others have two, three, four, &c. or more than can easily be counted. The Seed-Vessel, in the newly opening flower, is called the Germen; but when it enlarges it is termed the Seed-Vessel. some plants have no appendage of the kind, and then the seeds are uncovered, as in the dead nettle; the cup, however, generally incloses and retains the seeds till they ripen: and in the tribe of grasses, this friendly office is generally performed by what was previously called the blossom Seeds are sufficiently well known to render a description unnecessary: the part to which they are affixed within the Seed-Vessel, is termed the Receptacle of the seeds.

Nectaries are those parts in a flower which are designed to prepare a sweet nectareous liquor. The tube of the blossom, as in the honey-suckle, frequently answers the purpose; but in many other flowers, there is a peculiar organisation for the purpose. At the base of the petal, in the crown imperial, the Nectary is a very peculiar one, containing the liquor, from which, as there are few flowers in a greater or less degree unprovided with it, the little industrious bee derives its honey.

The Receptacle is the seat or base to which the various divisions of a



flower are affixed Thus, if you pull off the Calyx, the Blossoms, the Stamens, the Pistils, and the Seeds or Seed-Vessel, the substance remaining on the top of the stalk is the Receptacle. In many plants it is not particularly striking, but in others it is remarkably so; thus in the artichoke, after removing the Calyx, the Blossoms, and the bristly substances, the remaining part, so highly esteemed for the table, is the Receptacle.

The application of the different divisions of a flower, are simply elucidated in the following specimen of a crown imperial; but should it not be easy to procure one, a tulip or lily will answer the purpose nearly as well.

Crown Imperial. (Figure 32. Pl. Botany.)

Calyx———None.

Blossom——Six Petals, *a. a. a a. a. a.*

Stamens——Six, *bc. bc. bc bc. bc. bc* Filaments six-shaped, like an awl, *b. b. b. b. b. b.* Anthers oblong, four-cornered, *c c c c. c. c.*

Pistils——Single. Germen oblong, three-cornered, *d.* Style longer than the Stamens, *e.* Summit with three divisions, *f.*

Seed-Vessel—An oblong capsule with three cells and three valves Fig. 33 represents the Seed-vessel, cut across to show the three cells in which the seeds are contained.

Seeds———Numerous and flat.

The Classes are next to be considered, which were, according to the system of Linnæus, divided into twenty-four.

The characters are taken either from the number, length, connexion, or situation of the Stamens.

The first class comprehends all that have a single stamen in each blossom, and this he calls *monandria* (one male) fig 1; the second class such as have two stamina, called *diandria* (two males) fig. 2; the third, fourth, and so on, up to the tenth, are named in the same way, *triandria* (three males) fig 3, *tetrandria* (four males) fig. 4, to 10, &c &c There being no plants with eleven stamina, and the number not being uniformly twelve in many plants, though there or thereabouts, the eleventh class, called *dodecandria* (twelve males) fig. 11, includes all plants that have from eleven to nineteen inclusive If the stamina are twenty or more, and are attached to the calyx or corolla, the plants belong to the twelfth class, *icosandria* (twenty males) fig 12 If above nineteen, and attached to the base of the flower, and not to the calyx or corolla, they are of the class *polyandria* (many males) fig 13, which is the thirteenth class. Plants with four stamina, two of which are shorter than the other two, are in the fourteenth class, *didynamia* (two powers) fig. 14 Plants with four long and two short stamina constitute the fifteenth class, the *tetradynamia* (four powers) fig 15 In *monadelphia*, which is the name of the sixteenth class, the threads of the stamina are all united at bottom, but the antheræ are separate, fig 16. In *diadelphia* the threads are united, not altogether, but in two bodies, fig. 17. In *polyadelphia* they are connected in three or more bodies, fig. 18. If the threads are separate, but the antheræ united, the plant is in the nineteenth class, *syngenesia*, fig. 19. In all the above classes the stamina are distinct, and separate from the pistillum, but where the former grow upon the latter, the plant is of the class *gynandria*, which is the twentieth, fig. 28 Sometimes the stamina are in one blossom, and the pistillum or pistilla in another, but on the same plant: in this case they form the class *monœcia* (one house) fig. 29. But if the staminiferous blossom is on one plant, and the pistilliferous on another, it is of the twenty second class, *diœcia* (two houses) fig 30. And lastly, if some blossoms have both stamina and pistilla, and others only one or the other, whether on the same plant. or on different plants, they come under the twenty-third class, *polygamia*, fig. 31. These include all vegetables whose flowers are conspicuous. But there are some, as mosses, sea-weeds, mushrooms, &c. whose flowers are inconspicuous, or whose parts of fructification are not stamina and pistilla. These are all arranged together in the twenty-fourth class, called *cryptogamia* See fig 20—7.

These 24 classes have been recently reduced to 20, which may be thus arranged with examples under each

TABLE OF THE CLASSES.

Class.	Stamens in each flower.	Fig	Examples.
1. Monandria	— one	1 a.	Mares-tail, Parsley-piert.
2 Diandria	— two	2 b	— Privet, Sage.
3 Triandria	— three	3 a a a	Yellow Flag, the Grasses.
4 Tetrandria	— four, all of the same length	4	— Plantain, Scabious.
5 Pentandria	— five, the anthers not united	5	Honeysuckle, Primrose
6 Hexandria	— six, all of the same length	6	Snowdrop, Asparagus.
7. Heptandria	— seven	7	— Horse Chesnut.
8 Octandria	— eight	8	Mezereon, Heath, Willowherb
9. Enneandria	— nine	9	Bay Tree, Flowering Rush
10 Decandria	— ten, the filaments not united	10	Campion, Pink, Arbutus.
	12 to 19		— Houseleek.
12. Icosandria	more than 12, fixed to the calyx or petals	12	Hawthorn, Plum, Rose
13 Polyandria	20 to 1000, fixed to the receptacle	13	Poppy, Larkspur, Anemone
14 Didynamia	— four, 2 long and 2 short	14	Ground Ivy, Foxglove.
15 Tetradynamia	— six, 4 long and 2 short	15	Cabbage, Wall-flower.
16 Monadelphia	— the filaments united	16	— Mallow Geranium
17 Diadelphia	in 1 or 2 sets, blossoms butterfly shaped	17	Pea, Furze, Broom.
18 Polyadelphia	— in 3 or more sets	18	Orange, St. John's Wort.
19. Syngenesia	5 stam. anthers united, flowers compound	19	Coltsfoot, Sunflower, Thistle.
20. Cryptogamia	— flowers inconspicuous	20	Fern, Moss, Liverwort, Sea-Weeds, Mushrooms.

A knowledge of the orders may be very easily attained, by observing, that.

In the class Didynamia, they depend upon the seeds having a seed vessel, or not

Tetradynamia, upon the shape of the seed-vessel

Syngenesia, upon the structure of the florets

Cryptogamia, upon the natural assemblages of plants resembling each other

And that in all the other classes, excepting Monadelphia, Diadelphia, and Polyadelphia, they depend upon the number of pistils only. In determining the number of pistils, count the styles, as they appear at their bottom part, or base, but if the summits are not supported upon styles, then count the summits.

Recapitulation of the Classes, with their attendant Orders and familiar examples.

Monandria.
- Order Monogynia (1 pistil) Common Stonewort.
- Digynia (2 pistils) Water Fennel.
- Tetragynia (4 pistils) Pondweed.

Diandria.
- Order Monogynia (1 pistil) Privet.
- Digynia (2 pistils) Sweet-scented Vernal Grass

Triandria
- Order Monogynia (1 pistil) Wild Vine.
- Digynia (2 pistils) Meadow Foxtail
- Trigynia (3 pistils) Small water Chickweed
- Enneagynia (9 pistils) Blackberried Heath.

Tetrandria.

Order Monogynia (1 pistil) Shepherd's Rod.
Digynia (2 pistils) Chickweed Toad-grass.
Trigynia (3 pistils) Common Box.
Tetragynia (4 pistils) Common Holly.

Pentandria.

Order Monogynia (1 pistil) Water Mouse-ear.
Digynia (2 pistils) Common Hop.
Trigynia (3 pistils) Dwarf Elder.
Tetragynia (4 pistils) Grass of Parnassus.
Pentagynia (5 pistils) Round leaved Sun dew.
Polyginia (many pistils) Little Mouse-ear.

Hexandria.

Order Monogynia (1 pistil) Common Snow drop.
Trigynia (3 pistils) Meadow Saffron.
Hexagynia (6 pistils) Saracen's Birth-wort.
Polygynia (many pistils) Water Plantain.

Heptandria.

Order Monogynia (1 pistil) Chickweed Winter-Green

Octandria

Order Monogynia (1 pistil) Rosebay Willow-Herb
Digynia (2 pistils) Common Hazle-Nut Tree
Trigynia (3 pistils) Snake Weed.
Tetragynia (4 pistils) Water Wort.

Enneandria

Order Digynia (2 pistils) Dog Mercury.
Hexagynia (6 pistils) Flowering Rush.

Decandria

Order Monogynia (1 pistil) Wild Rosemary.
Digynia (2 pistils) London Pride
Trigynia (3 pistils) Greater Stitchwort
Pentagynia (5 pistils) Cuckoo Flower.

Dodecandria.

Order Monogynia (1 pistil) Floating Horn-weed.
Digynia (2 pistils) Common Agrimony.
Trigynia (3 pistils) Chesnut Tree
Dodecagynia (12 pistils) Common House-leek.

Icosandria

Order Monogynia (1 pistil) Black-thorn.
Digynia (2 pistils) Hawthorn
Trigynia (3 pistils) Mountain Ash.
Pentagynia (5 pistils) Crab Tree
Polygynia (many pistils) Common Meadow Sweet.

Although this is called the class of 20 Stamens, because the flowers arranged under it generally contain about that number; yet the classic character is not to be taken merely from the number of stamens, but from a consideration of the following circumstances, which will sufficiently distinguish it both from the preceding and following classes.

Calyx, consisting of one leaf, concave.
Petals, fixed by claws to the inside of calyx.
Stamens, more than 19, standing upon the petals or calyx, (but not upon the receptacle.)

Polyandria.

Order Monogynia (1 pistil) Common Celandine.
Digynia (2 pistils) Upland Burnet.
Trigynia (3 pistils) Wild Larkspur.
Pentagynia (5 pistils) Columbine.
Hexagynia (6 pistils) Water Aloes.
Polygynia (many pistils) Wood Anemone.

Most of this class are poisonous.

Didynamia.

Order Gymnospermia (seeds uncovered) Red Dead Nettle.
Angiospermia (seeds covered) Common Eyebright.

The plants in the first order of this class are odoriferous and cephalic, none of them are poisonous

Tetradynamia

Order Siloculosa (Pouch, or broad Pod) Horse radish

" Siliquosa (long Pod) Wall flower

It is necessary to remark, that the flowers of this class have uniformly 4 petals, an attention to this circumstance will probably save the learner some trouble, as the difference in the length of the stamens is not always very obvious, and especially as the plants of the Hexandria class have none of them 4 petals

Monadelphia

Order Triandria (3 stamens) Juniper Tree

Decandria (10 stamens) Wood Cranesbill

Polyandria (many stamens) Common Mallow

In this class the filaments are all together at the bottom, but separate at the top The orders in this and the two following are determined by the number of the stamens

Diadelphia

Order Hexandria (6 stamens) Common Fumitory

Octandria (8 stamens) Common Milkwort.

Decandria (10 stamens) Common Vetch

This class comprehends the butterfly shaped flowers From the name of this class, the young botanist will be induced to imagine, that the filaments are always formed into two sets, but this is by no means the case, as in many instances they are united into one set The butterfly shape of the blossom will therefore (as in the garden pea) be a more certain guide

Polyadelphia

Order Polyandria Common St John's Wort

Syngenesia

Order Polygamia Æqualis Florets furnished with stamens and pistils Common Sow thistle

Polygamia Superflua Florets in the centre, furnished with stamens and pistils, those in the circumference with only pistils Groundsel

Polygamia Frustanea Florets in the centre, furnished with stamens and pistils, those in the circumference without any Corn flower

Polygamia Necessaria Florets in the centre, furnished with stamens and pistils, but producing no seed Those in the circumference with only pistils, and producing seed Marigold

Polygamia Segregata (Separated florets) That is when several florets, each having its own proper cup, are inclosed within one common calyx so as to form altogether one flower only

The Syngenesia class comprehend those flowers which botanists have agreed to call compound The essential character of a compound flower, consists in the anthers being united, so as to form a cylinder, and a single seed, being placed upon the receptacle, under each floret The Dandelion, the Thistle and the Sun flower, are compound flowers, that is, each of these flowers are composed or compounded of a number of small flowers, called florets

The Cryptogamia class, consists of those plants in which the obscure and peculiar fructifications do not fall under either of the preceding distributions, they are divided into five orders

1 Miscellaneæ—Miscellaneous Including subjects incapable of arrangement under any of the following, and in many respects disagreeing with one another, as the horsetail, &c

2 Filices—Ferns A well known kind of production, comprising plants which have their flowers disposed in spots or lines, on the under surface of the leaves, as in the Polypody and Spleenwort, though sometimes in spikes, as in the Osmund Royal

3 Musci—Mosses Familiar subjects

4 Hepaticæ, a kind of mosses Distinguished from the foregoing, by a difference in the fructification Liverworts

5 Algæ, including plants which scarcely admit of a division into root, stem, and leaf, to these belong the different kinds of Lichens, and Fucus, or Sea-weed Flag

6. Fungi—Fungusses. Common objects comprising mushrooms, &c.

"Thus have we given a sketch of the Linnæan division of the vegetable kingdom into twenty-four classes, and of each class into two or more orders.

"The next division is into *genera* or families, each genus uniting together all those plants which bear so strong an affinity as to be considered members of the same family. The name given to the genus is the name by which all the plants of that family are known: thus, the genus *rosa* includes all the different kinds of roses; *salix*, which is the scientific name for willow, every kind of willow; *convolvulus*, every kind of bindweed; and *erica*, all the heaths. The distinctive or characteristic marks upon which the genera are founded, are always taken from the shape, position, number, or some other property of the different parts of the flower, as the calyx, petals, seeds, seed-vessels, &c.; whether they be round, or heart-shaped; whole, or divided; rough, or smooth; single, or many; and the like.

"There is only one more division necessary to bring us down to particular plants. For instance, I have found, that my newly gathered flower is a rose, a convolvulus, or a heath, but I want to know what kind of rose, convolvulus, &c. For this purpose each genus is divided into *species*, the characteristic marks of which are formed upon the leaves, stems, roots, or any other parts of the plant, except the flower; and some name, called the specific or trivial name, is given to each species, thus characterised, which, added to the name of the genus, sufficiently distinguishes each particular plant: thus, there is the *salix lanata*, *salix latifolia*, *salix repens*, or the woolly willow, the broad-leaved willow, the creeping willow, and several others, which are all species of the genus *salix*, or willow, in the same way that the long-eared bat, the common bat, the vampyre bat, and the horse-shoe bat, are all species of the same genus *vespertilio*, or bat.

"We have now gone through all the divisions and subdivisions of Linnæus's system of classification for the vegetable kingdom; and have arrived at the ultimate object of our research, in ascertaining the family and species to which any individual plant may belong. I shall now elucidate the whole by an example.

"Suppose that you have found, and brought home from your walk, a delicate, blue, bell-shaped flower, called by some bell-flower, by others Canterbury-bell, and by others again blue-bell. You naturally wish to know by what name this plant is distinguished by the botanist, what name all scientific men in every country have agreed to give it, that you may be at no loss under what name to look for a description of it, or how to communicate to others any observations you may have made upon this plant yourself.

"In the first place, then, examine how many stamina, or how many of those small bodies called its antheræ, are to be found in the bell-shaped corolla, or blossom; you discover five; now run over the classes of Linnæus, till you come to that, which is distinguished by its five stamina; this is called *pentandria*, and you therefore know your flower to be in this class. Next look for the pistillum or pistilla, of which in this plant you will find only one; this characterises the first order, called *monogynia*, and therefore your plant is in the class *pentandria*, and order *monogynia*. You have now done with the stamina and pistilla, and must attend to the other parts of the flower, comparing them, as you go on, with the characters of all the genera in this first order of the fifth class. The calyx you find to have five divisions, sharp, and not quite upright; the corolla of one petal, bell-shaped with five clefts, close at the base; shrivelling: segments broad, sharp, open; seed vessel roundish, of three or four cells; all which tallies exactly with the generic character of *campanula*; this, therefore, is the genus, and you have now only to find out to what species yours belongs. The leaves nearest to the roots, and which are generally so close to the ground as to require care not to leave them behind in gathering the plant, you will find to be round, or rather heart-shaped, or sometimes kidney-shaped, whilst the leaves on the stem are narrow, and strap-shaped; this determines the species, and in this your flower agrees with the character of that called *rotundifolia*. You have therefore now determined your plant to be the *campanula rotundifolia*, and you may read all the descriptions of this plant without a doubt as to its being the same, and may describe to others, where you found it, when you found it, and what else you know of it, without any fear of confounding it with any other blue bell-shaped flower, of which there are many, both of this and of other genera."

Botany is a domestic amusement so delightful and so useful, that we do not scruple to insert the elements of the Linnæan system in another form, although at the expense of some tautology.

1. Vegetables or *Plants*, are natural bodies endowed with organisation and life, with the power of taking in food, digesting it, assimilating it to their own substance, and thereby of increasing in size; until, like animals, they arrive at mature age and growth; then they gradually decline, like animals, in strength and health; become subject, like animals, to diseases and old age, until they die. They seem to be destitute of voluntary motion and sense. Botany is that branch of natural science which treats of their structure and functions, the systematical arrangement and denomination of their several kinds, and their peculiar properties and uses.

2 The principal parts of plants are the *root;* the *herb* or plant itself; and the *fructification*, or flower and fruit.

3. As it is our sole object to describe, in a concise manner, the Linnæan arrangement of plants, for the purpose of explaining the classification adopted in this form, the parts of *fructification* only will be mentioned. These are the calyx, corolla, stamens, pistil, seed-vessel, seeds, and receptacle

4. The calyx, or flower cup, is the green part which is situated immediately beneath the blossom. In some plants this consists of one, in others of several leaves; and it is frequently tubular, as in the polyanthus, and cowslip

5. The corolla, or blossom, is that coloured part of every flower on which its beauty principally depends, and which is generally called the flower. The leaves that compose it are denominated *petals* Some flowers, as the convolvulus and campanula, have only a single petal; and others, as the rose and peony, have several petals.

6. In the centre of the flower there are two kinds of organs on which the fructification and reproduction of the species more particularly depend. These are the stamens, and the pistil. The stamens are slender thread-like substances, which surround the pistil. They each consist of a *filament* or thread, and an *anther* or summit, which contains, when ripe, a fine dust or powder called *pollen:* which being shed upon the pistil, gives life to the seed, and causes it to grow.

7. The pistil is a prominent part, immediately in the centre of each flower, which adheres to the fruit, and is destined for the reception of the pollen. Some flowers have only one pistil; others have two, three, four, &c. and others more than can easily be counted. The stamens are sometimes called *Chives:* the pistils *Pointals*

8. At the foot of the pistil is situated the germen, which, when grown to maturity, has the name of pericarp or seed-vessel, and is that part of the fructification which contains the seeds, whether it be a *capsule* as in the poppy, a *nut* as the filbert, a *drupe* as the plum, a *berry* as the gooseberry, a *pome* as the apple, a *pod* as in the pea, or a *cone* as of the fir-tree.

9. That part of every vegetable, which, at a certain state of maturity, is separated from it, and contains the rudiments of a new plant, is called the seed

10. The receptacle is the base which connects all the parts of fructification together, and on which they are seated. In some plants this is very conspicuous, and in none more so than the artichoke, of which it forms the eatable part, called the bottom.

11. The Linnæan system of classification of plants is founded upon the supposition that the stamens represent the *male* and the pistils the *female* parts of fructification. The whole vegetable creation has been distributed by Linnæus into twenty four *classes*. These are divided into *orders*, which are subdivided into *genera* or tribes; and these genera are further divided into *species* or individuals.

12. Of the classes the discriminating characters, are taken from the number, connexion, length or situation of the stamens In each of the first twenty classes there are stamens and pistils in the same flower; in the twenty-first class they are in distinct flowers on the same plant; in the twenty-second, in distinct flowers on different plants; in the twenty-third, in the same flower and also in distinct flowers; and in the twenty-fourth class they are not at all discernible. Thus:

CLASSES

The stamens considered according to their				Classes.
Number.	Number only,		One,	1. Monandria.
			Two,	2. Diandria.
			Three,	3. Triandria.
			Four,	4. Tetrandria.
			Five,	5. Pentandria.
			Six,	6. Hexandria.
			Seven,	7. Heptandria.
			Eight,	8. Octandria.
			Nine,	9. Enneandria.
			Ten,	10. Decandria.
			About twelve,	11 Dodecandria
	and their	Insertion	On the calyx: more than nineteen	12 Icosandria.
			Not on the calyx: more than nineteen	13. Polyandria.
		Proportion unequal,	Four: two long and two short	14 Didynamia.
			Six: four long, and two short	15. Tetradynamia
Connexion by	Filaments united,		In one set	16. Monadelphia.
			In two sets	17. Diadelphia.
			In three or more sets	18. Polyadelphia.
	Anthers united			19 Syngenesia.
	Stamens upon the pistil			20. Gynandria.
Separation of pistils,	On the same plant			21 Monœcia.
	On two plants			22 Diœcia.
	With flowers of both sexes			23. Polygamia.
Not being discernible				24. Cryptogamia.

13 The characters of the ORDERS are most commonly taken from the number of the pistils; but sometimes from circumstances relative to the stamens, pistils, or seed. Those of the *first thirteen classes* are taken from the number of pistils, thus:

Monogynia,	1 pistil.
Digynia, -	2 pistils.
Trigynia,	3 pistils.
Tetragynia,	4 pistils.
Pentagynia,	5 pistils.
Hexagynia	6 pistils.
Heptagynia, -	7 pistils.
Octagynia, -	8 pistils.
Enneagynia, -	9 pistils.
Decagynia, -	10 pistils.
Dodecagynia, about	12 pistils.
Polygynia, -	many pistils.

The orders of the fourteenth class *Didynamia* are taken from the situation of the seeds:

Gymnospermia, - naked seeds

Angiospermia, - seeds in a capsule.

The orders of the fifteenth class *Tetradynamia* are formed from a difference in the shape of the seed vessel:

Siliculosa, - a broad pod.

Siliquosa, - a long pod.

In the classes *Monadelphia*, *Diadelphia*, *Polyadelphia*, and *Gynandria*, the orders are taken from the number of stamens:

Pentandria, - 5 stamens,

Hexandria, &c - 6 stamens, &c.

In the nineteenth class, *Syngenesia*, the orders are taken from the structure of the flower:

Polygamia æqualis,—all the florets alike.

Polygamia superflua,—the florets of the centre perfect or united; those of the margin with pistils only, but all producing perfect seeds.

Polygamia frustranea,—the florets of the centre perfect or united; those of the margin, in general, without either stamens or pistils.

Polygamia necessaria,—the florets of the centre with stamens only; those of the margin with pistils only.

The classes *Monœcia*, and *Diœcia*, take their orders from the number and other peculiarities of the stamens.

Monandria, 1 stamen.

Diandria, &c. 2 stamens, &c.

Polyandria, 7 stamens.

Monadelphia, stamens united into one set

Polyadelphia, stamens united into several sets.

Gynandria, stamens upon the pistil.

In the class *Polygamia* there are three orders:

Monœcia.

Diœcia.

Triœcia.

The twenty-fourth class, *Cryptogamia* has five orders:

1. Fern, - Filices.
2. Mosses, - Musci.
3. Liverworts, - Hepaticæ
4. Flags, - Algæ.
5. Mushrooms, - Fungi

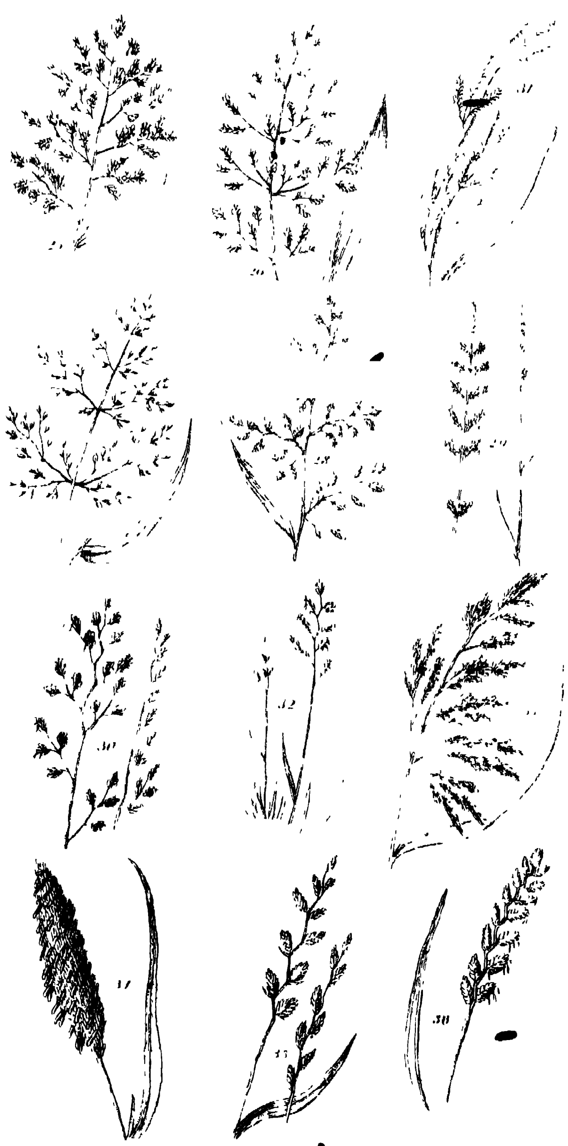
[To which are sometimes added, a 6th order, *Miscellaneæ*, or plants with concealed or obscure parts of fructification (cryptogamous) not reducible to the preceding five orders

The following delineations of plants, including a reference to the plates of the second form of the Linnæan system, may be of use to the botanical student —T C]

No.	Plant	Parts	Class and order
1.	Olive -	Flowers, fruit, and leaves	*Monandria monogynia.*
2	Ginger -	Flowers and leaf	*Monandria monogynia.*
3	Black pepper	Branch with fruit -	*Diandria trygynia*
4	Cardamom	Flower, fruit, and leaf	*Monandria monogynia*
5	Sugar -	Leaves and cane -	*Triandria digynia*
6	Saffron -	Flower - - - - -	*Triandria monogynia*
7	Scammony	Flower and leaf -	*Pentandria monogynia*
8	Jalap -	Flower and leaf -	*Pentandria monogynia*
9	Coffee -	Flower, fruit, and leaf	*Pentandria monogynia*
10	Peruvian Bark	Flowers and leaves	*Pentandria monogynia*
11	Tobacco -	Flowers and leaf -	*Pentandria monogynia*
12	Annual Capsicum	Flower, fruit, and leaves	*Pentandria monogynia*
13	Wheat - - - .		*Triandria digynia*
14	Oats - -		*Triandria digynia*
15	Barley - - .		*Triandria digynia*
16	Rye.		*Triandria digynia*
17	Sweet scented Vernal Grass		*Diandria digynia*
18	Cotton Grass -		*Triandria digynia*
19	Bull-rush -		*Triandria digynia*
20	Meadow Fox tail Grass - -		*Triandria digynia*
21	Timothy, or Meadow Cat's tail Grass		*Triandria digynia*
22	Fiorin, or Orcheiton long Grass -		*Triandria digynia*
23	Meadow soft Grass, or Yorkshire white Grass		*Triandria digynia*
24.	Mountain Melic Grass		*Triandria digynia*
25	Purple Melic Grass -		*Triandria digynia.*
26	Reed Meadow Grass -		*Triandria digynia*
27	Smooth stalked Meadow Grass		*Triandria digynia*
28	Annual Meadow Grass		*Triandria digynia*
29	Crested Dog's tail Grass		*Triandria digynia*
30	Hard Fescue Grass -		*Triandria digynia*
31	Flote Fescue Grass		*Triandria digynia*
32	Sheep's Fescue Grass		*Triandria digynia*
33	Common Reed -		*Triandria digynia*
34	Sea Matweed -		*Triandria digynia*
35	Rye, or Ray Grass		*Triandria digynia*
36	Couch, or Squitch Grass		*Triandria digynia*
37	Flax - - -	Flowers and leaves	*Pentandria tetragynia*
38	Socotrine Aloe -	Flowers and leaf -	*Hexandria monogynia*
39	Rice - -	Flowers and leaf - -	*Hexandria digynia*
40	Cinnamon	Flowers and leaves	*Enneandria monogynia*
41	Camphor -	Flowers and leaves	
42	Cashew Nut -	Leaves and fruit -	*Enneandria monogynia*
43	Mahogany -	Flowers and leaves -	*Decandria monogynia.*
44	Logwood - -	Flowers and leaves -	*Decandria monogynia*
45	All spice, or Pimento	Leaves and fruit -	*Icosandria monogynia*
46	Almond -	Flowers, fruit, and leaves	*Icosandria monogynia*
47	Pomegranate -	Flowers, fruit, and leaves	*Icosandria monogynia*
48	Caper	Flowers, buds and leaves	*Polyandria monogynia*
49	Tea tree -	Flowers and leaves -	*Polyandria monogynia*
50	Clove - - -	Flowers and fruit -	*Polyandria monogynia*
51	Tamarind - -	Leaves and fruit	*Monadelphia triandria*
52	Cotton - - -	Flowers and leaves -	*Monadelphia triandria.*
53	Cowhage - - -	Flowers and leaf	*Diadelphia decandria*
54	Liquorice -	Flowers and leaf -	*Diadelphia decandria*
55	Orange - -	Flowers and leaves	*Polyadelphia decandria*
56	Lemon - - -	Flowers and leaf	*Polyadelphia decandria*
57	Bread fruit - -	Fruit and leaves -	*Monœcia monandria*
58	Maize, or Indian Corn	Ear	*Monœcia triandria*




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VEGETABLES.







Page VEGETABLES.



59	Cucumber -	Flowers, fruit, and leaves.	*Monœcia triandria.*
60	Indian Rubber -	Flowers and leaves -	*Monœcia monadelphia*
61	Common Elm	Leaves and flowers -	*Pentandria monogynia*
62	Broad leaved elm	Leaves and flowers -	*Pentandria monogynia*
63	Alder - -	Leaves and flowers -	*Monœcia tetrandria*
64	Beech - -	Leaves and fruit -	*Monœcia polyandria*
65	Sweet Chesnut	Leaf and fruit - -	*Monœcia polyandria*
66	Horse Chesnut -	Leaf and fruit - -	*Heptandria monogynia*
67	Hazel - -	Leaves, flowers, and fruit	*Monœcia polyandria*
68	Oak - - -	Leaves and fruit - -	*Monœcia polyandria*
69	Walnut	Leaves, flowers, and fruit	*Monœcia polyandria*
70	Sycamore -	Leaf, flowers, and fruit	*Octandria monogynia*
71	Plane -	Leaf and flowers	*Monœcia polyandria*
72	Mulberry -	Leaves and fruit - -	*Monœcia tetrandria*
73	Hornbeam -	Leaves and flowers -	*Monœcia polyandria*
74	White Poplar -	Leaves and flowers -	*Diœcia octandria*
75	Black Poplar	Leaves and flowers -	*Diœcia octandria*
76	Flowering ash -	Leaf and flowers - -	*Polygamia diœcia*
77	Lignum vitæ	Leaves and flowers -	*Decandria monogynia*
78	Quassia - -	Leaves and flowers -	*Decandria monogynia*
79	Common Ash	Leaves and fruit -	*Polygamia diœcia*
80	Nutmeg - -	Leaves and fruit - -	*Diœcia triandria*
81	Hop - -	Leaves and flowers -	*Diœcia pentandria*
82	Hemp -	Flowers - - -	*Diœcia pentandria*
83	Fig -	Leaf and fruit -	*Polygamia triœcia*
84	Morell - -		*Cryptogamia*

As the system of Jussieu, is now the prevailing system on the continent of Europe, some account of it is necessary.

The system of Jussieu is founded on the absence, presence, and number of the lobes that contain the embryo plant. These are called botanically *Cotyledons*. They serve to afford the first nourishment to the young plant, as the placenta or yolk of the egg to the fœtus or young bird. When the plant has grown to a certain size by means of the food afforded by the decomposition of the cotyledons, it is in a state to seek nourishment from the earth by means of its roots. In some plants, as mosses, mushrooms, &c. the cotyledons are hardly if at all distinguishable or perceptible.

In other plants, as in the cerealia, wheat, barley, &c. the seed has but one cotyledon. In others, as the bean, where they are very distinct, there are two cotyledons. Hence plants are Acotyledons, Monocotyledons, or Dicotyledons. These form the three grand divisions of plants.

The next class of characters is derived from the stamens and pistils, or sexual organs of plants. Herein it is observed that the stamens are inserted either upon the pistil, or under the pistil, or surrounding the pistil: that is, they are *Epigyne*, *Hypogyne*, or *Perigyne*.

But the stamens, are sometimes inserted in the corolla, which Jussieu considers as the product of the same secreted fluid that forms the stamens. Hence another subdivision occurs, founded also upon the place of insertion of the stamens, viz. *Epipetalous*. In fact, the stamens are sometimes converted into petals. Hence Jussieu considers the insertion of the corolla which contains the stamens, as the insertion of the stamens themselves. When therefore the stamens come immediately by insertion into contact with the pistils, it is called *direct*, or *immediate insertion*; but when the stamens are connected with the pistils by means of the corolla, then it is *indirect* or *mediate insertion*.

We have now *seven* grand *classes* of plants.

Acotyledonous wherein the cotyledons are not discernible.

Monocotyledonous wherein the cotyledon is single. These are subdivided into three classes, after the three modes of insertion of the stamens, viz. epigenous, hypogenous, and perigenous. As all the monocotyledonous plants are without petals, the insertion of the stamens is always immediate.

The *Dicotyledonous* plants contain also three classes, distinguished by the mode of insertion. Many plants of this class, have no corolla, so that it presents cases both of mediate and intermediate insertion. The Dicotyledonous plants are much more numerous than the

other two taken together, but they afford like the Monocotyledonous, three divisions only It would be desirable, if it could be done consistently with the harmony of the system, to multiply the subdivisions of this class In the Dicotyledonous plants, some have corollas, some not In the first, the insertion is always immediate or direct So it is in many plants that have only one corolla in this case JUSSIEU names the insertion *simply immediate*, to distinguish it from those plants wherein the insertion is *necessarily immediate*, which happens to apetalous flowers, or those devoid of a petal The other dicotyledonous plants, have the *insertion mediate*

We see then, that the dicotyledonous plants, have three principal distinctions

1 Where there is no corolla, insertion *necessarily immediate*
2 Where the corolla is distinguishable from the stamens, insertion *simply immediate*
3 Where the corolla bears the stamens, insertion *mediate*

But the subdivision may farther be considered relatively to the form of the corolla

When the corolla bears the stamens, it is almost always monopetalous Hence it follows, that in polypetalous plants, the petals are distinguishable from the stamens which are inserted in the same point of the flower, so that we may substitute, in lieu of the characters which indicate the two series of plants provided with corollas, other characters nearly equivalent and more easy to be observed characters drawn from the corolla considered either as simple or compound So that the three subdivisions of dicotyledonous plants, will present themselves either as *apetalous*, *monopetalous*, or *polypetalous* Here the *insertion* is dropt, and unnoticed, and the character is deduced from a conspicuous organ of the plant But we must still recur to the insertion when we come to subdivide each of these series into *hypogenous*, *perigenous*, and *epigenous* stamens This will form nine divisions instead of three At the head of these divisions, is placed that where the stamen is of necessarily immediate insertion, that is where no corolla is found It is natural that this division should follow the monocotyledons whose flowers are always apetalous

This approaches to TOURNEFORT's system, who divided the vegetable kingdom into apetalous plants—plants with a monopetalous corolla—and plants with a polypetalous corolla

But we have not yet exhausted the means of subdividing the dicotyledons the series of monopetalous flowers whose stamens are epigene, is also susceptible of a new point of distinction Among the flowers of this series, some have their stamens free and separate, others have them united by their anthers in one assemblage, as in the marguerite, salsafy, chicory, and other plants called *composite*, or *compound* We have now ten separations of character among the dicotyledon plants

On the other hand, we find a certain number of plants that escape the law of insertion, because the stamens and pistils are on different plants, as in hemp, or on different flowers of the same plant, as in the nettle Such plants are termed *irregular*, and form an 11th class, in all 15 classes—including the 3 which divide the monocotyledon vegetables, and the single class that are acotyledonous

JUSSIEU divides the classes into orders or families to the number of 100 the orders into sections, and these into genera The *classes* are characterised by the number of lobes, by the insertion of the stamens together with the form of the monopetalous corolla considered as supporting the stamens, or the polypetalous which do not support the stamens, and are subject to some exceptions

The characters which serve to determine the *orders* or families and inferior divisions, such as the presence or absence of a calyx, the number of the divisions of the calyx, the different ways in which it opens, &c do not *exactly* follow the natural order, but they are so grouped in this system, as to make the distinctions sufficiently plain

We are indebted to that distinguished botanist, his excellency M CORREA DE SERRA, minister from the court of Portugal to the United States, for the following reduction of all the Genera of Plants contained in the *Catalogus Plantarum Americæ Septentrionalis* of the late Dr MUHLENBERG, to the Natural Families of MR DE JUSSIEU's system Originally printed for the use of the gentlemen who attended his course of Elementary and Philosophical Botany, in Philadelphia, in 1815

SERIES I — ACOTYLEDONES

(Seed without any lobe)

1 Family —*Fungi*

Æcidium, Agaricum, Agaricus, Amanita, Aecidia, Boletus, Clavaria, Cono

plea, Cyathus, Dematium, Dædalea, Erineum, Fuligo, Geastrum. Geoglossum, Helvella, Himantia, Hydnum, Hysterium, Isaria, Leotia, Lycogala, Lycoperdon, Merisma, Mesenterica, Merulius, Monilia, Mucor, Næmaspora, Onygena, Peziza, Phallus, Physarum, Racodium, Rhizomorpha, Scleroderma, Sclerotium, Sistotrema, Sphæria, Stemonitis, Stilbospora, Thelephora, Trichia, Trichoderma, Tubulina, Uredo, Xyloma.

2 Family.—*Algæ.*

Alectoria, Artonia, Bæomyces, Borrera, Calicium, Cenomyce, Cetraria, Collema, Conferva, Cornicularia, Endocarpon, Evernia, Fucus, Glonium, Graphis, Gyrophora, Lecidea, Lecanora, Lepraria, Opegraphe, Peltidea, Parmelia, Porina, Ramalina, Spiloma, Sticta, Stereocaulon, Variolaria, Verrucaria, Ulva, Urceolaria, Usnea.

3. Family —*Hepaticæ.*

Anthoceros, Azolla, Jungermannia, Marchantia, Riccia.

4. Family —*Musci*

Barbula, Bartramia, Bryum, Buxbaumia, Climacium, Dicranum, Didymodon, Diphyscium, Fontinalis, Funaria, Grimmia, Gymnostomum, Hedwigia, Hypnum, Leskea, Meesia, Mnium, Neckera, Orthotrichum, Phascum, Polytrichum, Pterigonium, Sphagnum, Splachnum, Tetraphis, Timmia, Trichostomum.

5. Family.—*Filices.*

Acrostichum, Adianthum, Aspidium, Asplenium, Bernhardia, Blechnum, Botrychium, Cheilanthes, Dicksonia, Equisetum, Lycopodium, Lygodium, Onoclea, Ophioglossum, Osmunda, Polypodium, Pteris, Schizæa, Scolopendrium, Vittaria, Woodwardia, Zamia.

6. Family.—*Najades.*

Callitriche, Caulinia, Chara, Ceratophyllum, Hippuris, Lemna, Myriophyllum, Najas, Potamogeton, Ruppia, Saururus, Zannichellia.

Series II.—Monocotyledones.

(One single lobe in the seed.)

7. Family.—*Aroideæ.*

Acorus, Arum, Caladium, Calla, Orontium, Pothos, Zostera.

8. Family.—*Typhæ.*

Sparganium, Typha.

9. Family.—*Cyperoideæ.*

Carex, Cyperus, Dichroma, Eriophorum, Kyllingia, Schœnus, Scirpus, Scleria.

10. Family.—*Gramineæ.*

Ægilops, Agrostis, Aira, Alopecurus, Andropogon, Anthoxanthum, Apluda, Aristida, Arundinaria, Arundo, Atheropogon, Avena, Briza, Bromus, Cenchrus, Cinna, Chloris, Coix, Dactylis, Digitaria, Eleusine, Elymus, Erianthus, Festuca, Fuirena, Holcus, Hordeum, Ischæmum, Leersia, Lolium, Manisuris, Melica, Milium, Muhlenbergia, Oryza, Oryzopsis, Panicum, Paspalum, Phalaris, Phleum, Poa, Rottboella, Saccharum, Spartina, Stipa, Trichodium, Tripsacum, Triticum, Uniola, Zea, Zizania.

11 Family —*Palmæ.*

Chamærops, Rhapis.

12. Family.—*Asparagi.*

Asparagus, Convallaria, Dioscorea, Dracæna, Medeola, Smilax, Trillium.

13 Family.—*Junci.*

Alisma, Commelina, Eriocaulon, Helonias, Juncus, Mayaca, Melanthium, Narthecium, Nectris, Nolina, Pleea, Sagittaria, Scheuchzeria, Tofieldia, Tradescantia, Triglochin, Veratrum, Xyris, Zygadenus.

14 Family.—*Liliaceæ.*

Erythronium, Lilium, Streptopus, Tulipa, Uvularia, Yucca.

15 Family.—*Bromeliæ.*

Agave, Burmannia, Tillandsia, Tripterella.

16. Family.—*Asphodeli.*

Aletris, Allium, Anthericum, Hyacinthus, Phalangium, Ornithogalum.

17 Family —*Narcissi*

Amaryllis, Heteranthera, Hypoxis, Pancratium, Pontederia, Schollera.

18. Family.—*Irides*

Dilatris, Iris, Ixia, Sisyrinchium.

19 Family —*Musæ.*

No plants of this family are known to exist in the United States.

20 Family.—*Cannæ.*

Canna, Thalia.

21. Family —*Orchideæ.*

Arethusa, Cymbidium, Cypripedium, Epidendrum, Epipactis, Limodorum, Malaxis, Neottia, Orchis, Satyrium.

22 Family —*Hydrocharides.*

Hydrocharis, Nelumbium, Nymphæa, Pistia, Proserpinaca, Vallisneria.

Series III —Dicotyledones.

(Two lobes in the seed)

23. Family.—*Aristolochiæ.*

Aristolochia, Asarum.

24. Family.—*Æleagni.*

Hamiltonia, Hippophaë, Nyssa, Thesium.

25. Family.—*Thymeleæ.*

Dirca.

26. Family.—*Proteæ.*

No plant of this family is known to exist in the United States.

27. Family.—*Lauri.*

Laurus.

28 Family.—*Polygoneæ.*
Brunnichia, Coccoloba, Eriogonum, Polygonum, Rumex.
29 Family.—*Atriplices.*
Acnida, Atriplex, Blitum, Chenopodium, Kochia, Phytolacca, Polygonella, Rivina, Salicornia, Salsola
30. Family.—*Amaranthi.*
Achyranthes, Anychia, Amaranthus, Illecebrum, Iresine
31. Family—*Plantagines.*
Plantago
32 Family.—*Nyctagines.*
Boerhaavia.
33. Family—*Plumbagines.*
Statice.
34 Family.—*Lysimachiæ.*
Anagallis, Centunculus, Cyclamen, Dodecatheon, Hottonia, Lysimachia, Menyanthes, Micranthemum, Primula, Pinguicula, Samolus, Trientalis, Utricularia.
35 Family.—*Pediculares.*
Bartsia, Buchnera, Erinus, Euphrasia, Melampyrum, Obolaria, Orobanche, Pedicularis, Polygala, Rhinanthus, Veronica.
36. Family—*Acanthi.*
Dianthera, Elytraria, Justicia, Ruellia.
37 Family.—*Jasmineæ.*
Borya, Chionanthus, Fraxinus, Ligustrum, Olea, Syringa
38 Family—*Vitices*
Callicarpa, Lantana, Lippia, Verbena, Vitex.
39 Family.—*Labiatæ.*
Ajuga, Brachystemum, Clinopodium, Collinsonia, Cunila, Dracocephalum, Glechoma, Hyptis, Hyssopus, Isanthus, Lamium, Leonurus, Lycopus, Marrubium, Melissa, Mentha, Monarda, Nepeta, Origanum, Phryma, Prunella, Salvia, Satureia, Scutellaria, Stachys, Teucrium, Thymbra, Thymus, Trichostema
40. Family.—*Scrophulariæ*
Antirrhinum, Capraria, Digitalis, Gerardia, Gratiola, Lindernia, Mimulus, Polypremum, Scrophularia, Schwalbea.
41. Family—*Solaneæ.*
Atropa, Capsicum, Datura, Hyosciamus, Lycium, Nicotiana, Physalis, Solanum, Verbascum.
42. Family—*Borragineæ.*
Anchusa, Cynoglossum, Echium, Ellisia, Heliotropium, Hydrophyllum, Lithospermum, Lycopsis, Myosotis, Onosmodium, Phacelia, Pulmonaria, Symphitum.
43. Family—*Convolvuli*
Convolvulus, Cuscuta, Diapensia, Dichondra, Hydrolea, Ipomœa, Ipomopsis, Pyxidanthera.
44 Family.—*Polemonia.*
Cantua, Phlox, Polemonium.
45. Family.—*Bignoniæ.*
Bignonia, Chelone, Martynia, Maurandia, Pentstemon, Sesamum.
46. Family.—*Gentianæ.*
Bartonia, Chironia, Frasera, Gentiana, Ophiorrhiza, Spigelia, Swertia
47 Family.—*Apocyneæ.*
Amsonia, Apocynum, Asclepias, Cynanchum, Echites, Gelsemium, Gonolobus, Periploca
48. Family.—*Sapotæ.*
Bumelia.
49 Family—*Guajacanæ,*
Diospyros, Halesia, Hopea, Styrax, Symplocos
50. Family.—*Rhododendra.*
Azalea, Befaria, Itea, Kalmia, Ledum, Rhododendrum, Rhodora
51 Family.—*Ericæ*
Andromeda, Arbutus, Ceratiola, Clethra, Cyrilla, Elliottia? Empetrum, Epigæa, Galax, Gaultheria, Hudsonia, Menziesia, Oxycoccus, Pyrola, Vaccinium
52 Family—*Campanulaceæ.*
Campanula, Lobelia
53 Family—*Cichoraceæ.*
Cichorium, Hieracium, Hyoseris, Krigia, Lactuca, Leontodon, Prenanthes, Scorzonera, Sonchus, Tragopogon.
54. Family—*Cinarocephalæ*
Arctium, Carduus, Carthamus, Cnicus, Centaurea.
55 Family.—*Corymbiferæ.*
Achillæa, Acmella, Ageratum, Ambrosia, Anthemis, Arnica, Artemisia, Aster, Baccharis, Baltimora, Bellis, Bidens, Boebera, Boltonia, Buphthalmum, Cacalia, Cineraria, Conyza, Coreopsis, Chrysogonum, Chrysanthemum, Chrysocoma, Eclipta, Erigeron, Ethulia, Eupatorium, Elephantopus, Galardia, Gnaphalium, Helenium, Helianthus, Heliopsis, Hymenopappus, Inula, Iva, Kuhnia, Liatris, Marshallia, Mikania, Melananthera, Parthenium, Phaëtusa, Polymnia, Rudbeckia, Senecio, Sigesbeckia, Silphium, Spilanthus, Stokesia, Solidago, Tanacetum, Tetragonotheca, Tussilago, Verbesina, Vernonia, Xanthium.
56 Family—*Dipsaceæ.*
Allionia, Dipsacus, Fedia, Valeriana.
57 Family.—*Rubiaceæ.*
Cephalanthus, Chiococca, Diodia, Galium, Gardenia, Houstonia, Mitchella, Oldenlandia, Pinkneya, Rubia, Spermacocc

58 Family.—*Caprifolia.*
Caprifolium, Cornus, Diervilla, Hedera, Linnæa, Lonicera, Sambucus, Symphoricarpos, Triosteum, Viburnum, Viscum, Xylosteum.

59 Family.—*Araliæ.*
Aralia, Panax.

60. Family.—*Umbelliferæ.*
Ammi, Anethum, Angelica, Apium, Caucalis, Chærophyllum, Cicuta, Conium, Coriandrum, Daucus, Eryngium, Ferula, Heracleum, Hydrocotyle, Ligusticum, Œnanthe, Pastinaca, Sanicula, Scandix, Selinum, Sium, Sison, Thapsia, Tordylium.

61. Family.—*Ranunculaceæ.*
Aconitum, Actæa, Aquilegia, Anemone, Atragene, Brasenia, Caltha, Cimicifuga, Clematis, Delphinium, Helleborus, Hydrastis, Jeffersonia, Nigella, Podophyllum, Ranunculus, Thalictrum, Trollius, Zanthorhiza.

62 Family.—*Papaveraceæ.*
Argemone, Chelidonium, Corydalis, Fumaria, Papaver, Sanguinaria.

63 Family.—*Cruciferæ.*
Alyssum, Arabis, Biscutella, Brassica, Cakile, Cardamine, Cochlearia, Draba, Erysimum, Hesperis, Lepidium, Myagrum, Sennebiera, Sinapis, Sisymbrium, Thlaspi, Turritis.

64. Family.—*Capparides.*
Cleome, Drosera, Parnassia.

65. Family.—*Sapindi.*
Cardiospermum, Sapindus.

66. Family.—*Acera.*
Æsculus, Acer.

67. Family.—*Malpighiæ.*
Mylocarium.

68. Family.—*Hyperica.*
Ascyrum, Hypericum.

69. Family.—*Guttiferæ.*
Clusia.

70. Family.—*Aurantia.*
Citrus.

71. Family.—*Melia.*
Melia, Swietenia, Winteriana.

72 Family.—*Vites.*
Ampelopsis, Vitis.

73. Family.—*Gerania.*
Erodium, Geranium, Impatiens, Oxalis.

74. Family.—*Malvaceæ.*
Althæa, Gordonia, Gossipium, Hibiscus, Lavatera, Malva, Napæa, Sida, Stewartia.

75. Family.—*Magnoliæ.*
Illicium, *Liriodendrum, Magnolia, Quassia.

76. Family.—*Annonæ.*
Annona, Porcelia.

77. Family.—*Menisperma.*
Cissampelos, Menispermum, Schisandra, Wendlandia.

78. Family.—*Berberides.*
Berberis, Diphylleia, Hamamelis, Leontice.

79. Family.—*Tiliaceæ.*
Tilia.

80. Family.—*Cisti.*
Cistus, Helianthemum, Viola.

81 Family.—*Rutaceæ.*
Tribulus.

82. Family.—*Caryophilleæ.*
Agrostemma, Alsine, Arenaria, Cerastium, Cucubalus, Dianthus, Elatine, Holosteum, Lechea, Linum, Mohringia, Mollugo, Pharnaceum, Queria, Saponaria, Sagina, Sarothra, Silene, Spergula, Spergulastrum, Stellaria, Stipulicida.

83. Family.—*Sempervivæ.*
Cotyledon, Penthorum, Sedum.

84 Family.—*Saxifragæ.*
Adoxa, Chrysosplenium, Heuchera, Hydrangea, Mitella, Saxifraga, Tiarella.

85. Family.—*Cacti.*
Cactus, Ribes.

86. Family.—*Portulacæ.*
Claytonia, Portulaca, Scleranthus, Talinum, Tamnera.

87. Family.—*Ficoidea.*
Sesuvium.

88 Family.—*Onagræ.*
Circæa, Epilobium, Fuchsia, Gaura, Jussieua, Ludwigia, Œnothera, Serpicula.

89. Family.—*Myrti.*
Decumaria, Myrtus, Philadelphus Punica.

90. Family.—*Melastomæ.*
Rhexia.

91. Family.—*Salicariæ.*
Ammania, Cuphea, Glaux, Isnardia, Lythrum.

92. Family.—*Rosaceæ.*
Agrimonia, Alchemilla, Amygdalus, Calycanthus, Chrysobalanus, Comarum, Cratægus, Dalibarda, Fragaria, Geum, Mespilus, Potentilla, Poterium, Pyrus, Prunus, Rosa, Rubus, Sanguisorba, Sorbus, Spiræa.

93. Family.—*Leguminosa.*
Æschynomene, Amorpha, Arachis, Astragalus, Cassia, Cercis, Clitoria, Cæsalpinia, Crotolaria, Dalea, Erythrina, Galactia, Galega, Glycine, Glycirrhiza, Gleditsia, Gymnocladus, Lathyrus, Lupinus, Hedysarum, Medicago, Mimosa, Phaca, Phaseolus, Pisum, Podalyria, Psoralea, Robinia, Schrankia, Sesbania, Stylosanthes, Trifolium, Virgilia, Zornia.

94 Family.—*Terebinthi.*
Amyris, Juglans, Ptelea, Rhus, Zanthoxylum.

95 Family.—*Rhamni.*
Ceanothus, Celastrus, Euonymus, Ilex,

Prinus, Rhamnus, Staphylea, Ziziphus.

96. Family.—*Euphorbiæ.*

Acalypha, Adelia, Buxus, Croton, ..tonopsis, Euphorbia, Hippomane, Jatropha, Phyllanthus, Ricinus, Stillingia, Tragia.

97. Family —*Cucurbitaceæ.*

Carica, Cucumis, Cucurbita, Elaterium, Melothria, Momordica, Passiflora, Sycios.

98 Family —*Urticæ.*

Boehmeria, Broussonetia, Cannabis, Ficus, Humulus, Morus, Parietaria, Urtica.

99. Family.—*Amentaceæ.*

Alnus, Betula, Carpinus, Castanea, Celtis, Comptonia, Corylus, Fagus, Fothergilla, Liquidambar, Myrica, Ostrya, Platanus, Planera, Populus, Quercus, Salix, Ulmus.

100. Family.—*Coniferæ.*

Cupressus, Ephedra, Juniperus, Pinus, Taxus, Thuya.

Genera of Doubtful Families.

Datisca, Dionæa, Floerkea, Monniera, Monotropa, Podostemum, Sarracenia.

Since the system of M. DE JUSSIEU, two other arrangements have been published: the first of which is that of M. LEFEBURE, called by him, *Systeme Signalementaire.*

He has taken for the principal bases or elements of his system, the leaves of plants. The leaves attached one to one, two to two, three to three, form the first, second and third *classes.* These leaves placed either on a herbaceous stem, or on a woody stem, or at the foot of a herbaceous stem, form the three *orders;* twelve families borrowed from the twenty-two classes of TOURNEFORT, complete the subdivisions of the general arrangement; in which each genus takes its place according to an analogy which distinguishes the author's system from any heretofore projected. Whether this work deserves the encomiums lavished upon it, as possessing principles eminently proper to dissipate the difficulties of Botany, we cannot determine. It may certainly contribute to arrange those vegetables to which nature has given leaves, stems and flowers: these are an important and extensive part of the vegetable kingdom, and we concur in recommending the thought to the learned and ingenious. M. LEFEBURE entitles his work "Concordance of the three Systems of TOURNEFORT, LINNÆUS, and JUSSIEU."

The other arrangement is by M. PALISSOT DE BEAUVOIS.

LA METHERIE, the respectable conductor of the Journal de Phisique, a man of very extensive knowledge, and great research, but with an imagination that sometimes overruns his judgment, in his first Number for January 1816, in giving an account of science for the year 1815, has noticed some conclusions of PALISSOT DE BEAUVOIS, and closed them with a brief view by himself, of the analogies between plants and animals, which I think has interest.

PALISSOT DE BEAUVOIS (Jour. de Phys. Jan 1816, p. 20) has published observations on the arrangement and disposition of leaves, on the pith (moelle) of ligneous vegetables, and on the conversion of cortical layers into wood. He has drawn the following conclusions.

1st The form of the medullary case, or envelop of the pith (etui medullaire), varies in the ligneous dicotyledons. These variations are subservient to a constant law, and depend on the arrangement either of the branches or the leaves He has remarked in this case (etui) five different forms.

a. *Triangular:* as in the laurel rose, where the leaves are verticillated by threes.
b. The *Tetragon:* in trees, such as the linden, wherein the spiral formed by the leaves is composed of four leaves.
c. The *Pentagon:* in trees such as the oak, the chesnut, &c. when the spiral is composed of four leaves
d. The *Polygon:* in pines where the leaves are scattered.
e. The *round* or *oval:* in trees where the leaves are placed opposite to each other.

2dly. The pith (moelle) is absolutely necessary to sustain the life of the vegetable during its youth: but in old trees, as in willows deprived of pith, it is supplied by medullary radiating fibres.

3dly. The monocotyledons have no pith like the dicotyledons. Yet Rumphius, Daubenton, &c. remarked in the palm tree and some other plants, a substance analogous to the pith and medullary rays. Du Petit Thouars particularly informs us of the pandanus, the dracæna, and other monocotyledons, that differed greatly in this respect, from others of the same class. The gramens, the bamboos, &c. offer some

still more remarkable exceptions in this case.

4thly. The recent woody layers are produced by the *liber*, and not as Hales supposed by wood precedently formed: just as in animals, the recent layers of bone are the produce of periosteum.*

The pith, (moelle) says the author, varies in its form and its colour. In the willow and in many other trees, the longitudinal fillets are coloured red or brown, of which we have not yet determined the cause.

On this, La Metherie remarks, that he first described these red vessels in the sap of the willow, l'yeble, and the hortensia, in the great work which he published on vegetation. In raising the medullary substance of a branch of the willow, La Metherie says (Considerations sur les corps organizès t. 3, p. 454) I remarked a great number of red vessels which generally formed concentric zones. They are placed in the medullary substance a quarter of a line or more from the wood; in l'yeble they are very thick. Examined with a glass, they are semitransparent and composed of small knots like the lymphatic vessels in animals. They are perfectly distinct from the tracheæ or air vessels.

I presume they are meant to supply the circulation of the fluids in the medullary substance, like the vessels in fruits. I showed (says La Metherie) these vessels to several scavans, and to M Palissot himself.

Duhamel (in his Physique des Arbres, t. 1, p. 38) has spoken of longitudinal fibres which he observed in the pith of the willow; they assume, he says, a red colour in the old branches; but these fibres are not the red vessels of La Metherie, which are found in the youngest branches. In the Considerations sur les etres organisès, I have described (says La Metherie) with much care the different parts which form a vegetable, and I have shown that they are analagous to the different tissues or systems which Pinel, Bichat, and other physiologists have remarked in animals. I have compared the physiology of vegetables with that of animals, and all those who have observed the phenomena of living beings, have remarked the strong analogies between the organic functions of these two classes.

Such were Pythagoras, his disciple Empedocles, Hippocrates, Aristotle, Theophrastus, among the ancient philosophers of Greece. Such were among the moderns, Camerarius, Leuwenhoeck, Malpighi, Grew, Gesner, Perrault, Tournefort, Linnæus, Jussieu. All these have observed the analogy between animals and vegetables, and made it a ground of their researches.

As the functions of animals are better known than those of vegetables, the physiology of the latter has constantly been referred to that of the former. In my Considerations sur les etres organizès, I have pursued the same course, and taken a general view of these beings, divided into 15 classes.

1st and 2d classes, animals with bones and red blood

3d, 4th, 5th, 6th and 7th classes, animals without bones and with white blood.

8th and 9th classes, animals without bones or sexual distinctions; *agenist* (from alpha privitiva, and γιγνομαι gigno).

10th and 11th classes, agenist vegetables, without known sexual marks. Cryptogamous.

12th, 13th, 14th and 15th classes, vegetables with manifest sexual organs, acotyledons, monocotyledons, dicotyledons, polycotyledons.

And I have shown, continues La Metherie,

1st. That between the lowest classes of animals which are void of sexual distinction, (agenist or cryptogamous) such as the polypi, the wheel animals, &c. and the agenist or cryptogamous family of vegetables, also without marks of sexual distinction, those that form the commencement of vegetable organic being, the tremellas, the confervas, &c. there is so strong an analogy, that the line of distinction can hardly be drawn.

2dly. The organisation of vegetables has also the strongest analogy with that of animals; both are formed out of, composed of cellular tissue, serous membranes, mucous membranes, and fibrous membranes—of organs of respiration, nutrition, circulation and secretion.

3dly. Vegetables, like animals, have vital powers. They have irritability, excitability, and some of them, such as the valisneria, the mimosa, &c. have

* M. Mirbel had long insisted that the *liber* changed into wood: M. Du Petit Thouars, and Mr. Knight opposed this doctrine strenuously M. Mirbel has come forward in article 5 of the Bulletin de la Societe Philomathique for July 1816, and acknowledges he has been mistaken, and is now convinced of the impossibility of such a change ever taking place.

motions perfectly characterised Others, like the arums, have much sensible heat at the period of their flowering These vital powers in animals and in vegetables, appear to be the effects of galvanic action which their different parts exert on each other.

4thly. Vegetables feed and are nourished like animals. We find in the one and in the other a great variety of fluids secreted by the vital action of the system.

5thly These fluids circulate in vegetables, as they do in animals. This circulation differs in animals who possess a heart, arteries, and veins, from what it is in animals (as the agenist tribe) who have no heart. Vegetable circulation is most similar to that which takes place in the last mentioned and lowest species of animals

6thly. Vegetables respire; but their respiration seems most like that of the agenist animals

7thly. Vegetables have secretions analogous to those of animals, carried on by means of similar organs as glandular tissues.

8thly. Vegetables produce offspring like animals, for the most part by means of sexual organs and prolific fluid.

But among some vegetables, as among some animals, there is spontaneous generation.

9thly The vegetable lives, sleeps, and dies, like the animal. (He might have said, the vegetable lives, breathes, feeds, digests, secretes, excretes, sleeps, grows old, and dies either accidentally of disease, or naturally by rigidity of fibre, and gradually diminished excitability, like the animal)

This analogy of vegetable and animal organic functions, shows that scientifically, they may be classed as forming one family; and vegetable physiology cannot make its due progress unless by keeping in view these relations *

I have already referred to M. Mirbel's general view of vegetable nature: the following table of Humboldt is an interesting summary of the modern progress in botany. According to him the species of plants described by the Greeks, Romans and Arabians, scarcely amounted to 1400 (Prolegomena, p 11), at present the known species amount to 44,000. Of these, 6,000 are cryptogamous, 38,000 have flowers and several distinctions.

Of these 38,000 phanerogamous plants, the distribution according to Humbolt is as follows:

Europe - - - -	7000
Temperate regions of Asia	1500
Asia within the tropics and islands - - - -	4500
Africa - - - -	3000
Both temperate regions of America - - - - - -	4000
America between the tropics	13000
New Holland and the isles of the Pacific - - - -	5000
	38000

I suspect the work of De Labillardiere and the voyage to Australasia of Peron, will add greatly to the last of these articles

The third number of Mr. Brande's journal contains an account of a new species of agave—of the alstenia teiformis, a substitute for tea—and a new moss, named tyaloria splachnoides. Also a neat tabular view of the liliacées by J. P. Redouté; being an arrangement of the monocotyledons contained in the eight costly volumes of Redouté.

[BOTARGO the roes of the bass, or of the mullet, pickled in strong brine, and then pressed, and dried. Cavear, is botargo made from the roe of the sturgeon. It may be made from the roes of our American bass, or sturgeon, equal to the foreign; or even from the roe of the shad —T C]

BOTTLE, a small vessel made of glass, leather, or stone. Glass bottles are better for cyder than those of any other substance

Dr. Percival censures the common practice of cleansing wine-bottles with shot; for if through inattention, any of it should remain, when the bottles are again filled with wine, the metal will be dissolved, and the liquor impregnated with its deleterious qualities. For this reason, he recommends potash in preference to shot, as a few ounces of the former dissolved in water, will cleanse a great number of bottles: and where the impurities adhere to the sides, a few pieces of blotting paper put into the vessel, and shaken with the water, will remove them in an expeditious manner.

To make bottles air-tight—This may be done without luting or grinding,

* There is no doubt, I apprehend, of the existence of these analogies; still, nothing like voluntarity is distinctly made out among vegetable motions; so that for the present this seems to form a line of distinction.—T. C.

and consists in only having a groove round the neck, into which the cap fits, so that the groove may be charged with water, or mercury, or oil

To make an excellent smelling bottle.—Take an equal quantity of sal ammoniac and unslacked lime, pound them separate, then mix, and put them in a bottle to smell to. Before you put in the above, drop two or three drops of the essence of burgamot into the bottle, then cork it close. A drop or two of æther, added to the same, will greatly improve it.

[At the time I resided in Northumberland county, Pennsylvania, I had some bottles made of the common inferior pottery. On the first process, they were brittle, soft, and porous, consequently worthless. I directed them to be burnt over again, in a strongly-heated potter's furnace. They became stone-ware, struck fire with steel, and I now keep my quicksilver in them.—T. C.]

BOTTLING, the filling of bottles with liquor, and corking them in order to preserve it. Particular caution should be used in bottling cyder: the best way to secure the bottles from bursting, is to have the liquor thoroughly fine before it be bottled. If one bottle break, it will be necessary to give vent to the remainder, and cork them up again. Weak cyder is more apt to burst the bottles than that of a stronger quality: they should be placed so that the corks may be kept wet, and stowed in a cellar not exposed to the changes and influence of the air. For this purpose, the ground is preferable to a frame; and a layer of saw-dust or sand better than the bare soil: but the most proper situation is a stream of running water.

In order to ripen bottled liquors, they are sometimes exposed to moderate warmth, or the rays of the sun, which in a few days will bring them to maturity.

[Bottled beer and bottled cyder, are acid, and a very improper beverage for those who are subject to the gout, the stone, or the gravel. Bottled beer may be improved and rendered much more salubrious by the addition of a small quantity of salt of tartar or pearl-ash. —T. C.]

BOTTS, in zoology, a species of short worms produced and nourished in the intestines of a horse.

As the flies, from whose eggs the botts are produced, do not frequent the neighbourhood of large towns, horses are not liable to this disease, if they be kept in the stable during summer and autumn.

In summer the females of these flies enter the anus of the horse, where they deposit their eggs, which are soon hatched by the heat, and the worms penetrate into the intestines, sometimes as far as the stomach.

Botts are very large maggots, composed of circular rings with prickly feet, by which they adhere to the part where they breed, and derive their nourishment When they reach the stomach, they fasten themselves in its muscular coat, and suck the blood like leeches, each worm ulcerating the part where it fixes, till it resembles a honey-comb These worms are not unfrequently the cause of convulsions.

Botts that are generated in the stomach of the horse are extremely dangerous, and seldom discoverable till they have acquired some strength, when they throw him into great agonies.

The symptoms of the other kinds which are more troublesome than dangerous, are the following: The horse becomes lean, and looks jaded; his hair stands out roughly; he often strikes his hind feet against his belly, he is sometimes griped, but generally lies down quietly on his belly for a short time, and then gets up and eats his food. But the surest sign is, when he voids the botts in his dung.

For the cure of botts in the stomach, calomel should first be given in large quantities, and repeated at intervals. Then a purge.

The botts, that many horses are troubled with, in the beginning of summer, are always seen on the straight gut, and are often thrown out with the dung and a yellowish matter. They are not dangerous in that part, though they render the horse restless. The season when they affect the animal is commonly in the months of May and June, after which they are rarely seen, as they do not continue with the horse above a fortnight or three weeks. Botts in the straight gut may be cured by giving the horse a spoonful of savin, cut small, once or twice a day, in oats or bran moistened, to which may be added three or four cloves of garlic. The following aloetic purge should also be given at intervals: Fine socotrine aloes, ten drachms; fresh jalap, one drachm; aristolochia, or birthwort and

myrrh powdered, of each two drachms; oil of savin and amber, of each one drachm; syrup of buckthorn, enough to form the whole into a ball.

Mr ANDREW BILLINGS, of Poughkeepsie, New York, has proved that botts are produced from the eggs deposited by a fly upon the hairs of horses. The fly is about the size of the honey-bee, and the head and neck not much unlike it. It flies with its head and body erect and perpendicular to the horizon, while its tail forms a sharp angle with their bodies, being bent towards the horse, so that they touch the hair of his legs, or belly (which are the parts they most affect), only with the extremity of the tail, and in this way will fly about him for an hour, discharging a great number of eggs, which adhere to the ends of the hair. Mr. CHANCELLOR LIVINGSTON observes, that the late Dr. WEMPLE, a man of veracity and accuracy, proved the truth of Mr B's theory by the following experiment: One of his horses having been killed by the botts, he took the largest of the worms, and preserving them in a proper temperature they went through the usual changes, and produced flies exactly resembling those already described. Mr B also kept a hair to which an egg was attached, for some time, in a box, when a perfect bott extricated itself.

VALISNERY's theory of the introduction of the botts into the bodies of the animal, as stated by Dr. WILLICH, is probably erroneous. May not the egg be introduced by the horse licking and biting the part on which the eggs are deposited, to relieve an occasional itching?

To guard against the botts, therefore, attention must be paid to the flies, and killed when found buzzing about horses. The nits should be scraped off and a handful of salt given weekly.

BOUNTY, in commerce, a premium paid by government to the exporters and importers of certain commodities, such as corn, fish, &c.

Bounties are sometimes given to support a new manufacture against one of a similar kind established by other nations.

The principal attention of bounties to exporters is to enable the trader to become beneficial to his country, by giving him a compensation for his ingenuity and industry. As bounties are usually granted only for a limited time, they can never be the cause of any material loss to a nation, though avaricious men are often stimulated by a desire of gain, to convert to their private advantage what was intended for the benefit of the community.

BOW, a weapon made of wood, horn, or some other elastic substance, and bent into a curve, in which position it is kept by a string fastened to each end. The elastic power thus acquired, is such that after bending and unbending, an arrow is impelled with great force.

The strength of a bow is calculated on the principle, that its spring or elastic power is proportionate to the extent of its curve. The use of the bow is termed archery, and those who practise it, are called bowmen, or archers. See ARCHERY.

Cross bow. This weapon consists of a steel bow set in a shaft of wood, with a string and trigger. It is bent by means of a piece of steel, and expels bullets, large arrows, darts, &c. with great velocity.

BOWELS, or intestines, are very important parts in the animal economy. (See ABDOMEN); and are often subject to diseases, which, if neglected, may be attended with dangerous consequences. Of this nature, in particular, are inflammations of the bowels, which manifest themselves by a continued acute pain, frequently accompanied with a sensation of burning. The abdomen is pained on the slightest touch, and the body is generally costive. After taking any kind of nutriment, the patient is inclined to vomit; but the principal symptom, by which the inflammatory state of the intestines may be distinguished from a mere cholic, is a peculiar fever, with a small, though hard pulse, while the heat in the extremities of the body continues almost the same as when in a state of health. The most frequent causes of this dangerous complaint are, acrid substances in the bowels; crude and hardened feces; confined ruptures; suppressed hemorrhages; violent diarrhœas and dysenteries; abortions, &c. At their commencement, inflammations are often confounded with other complaints; and sometimes they terminate in a fatal mortification, though more frequently in suppuration. The degree of danger may be ascertained by the increasing coldness of the extremities; and the more or less inveterate obstipations of the bowels. Hiccough, and vomiting of excrements, indicate the approach of dissolution.

If the inflammation be occasioned by a confined rupture, it sometimes may be reduced by applications of cold water and ice, or still more effectually by dropping and evaporating vitriolic æther on the protuberant part. Diluent and emollient liquids are of no service in this case, as they only contribute to distend the bowels; and where the external application of cold has no effect, the patient must, without delay, submit to an operation.

Suppressed hemorrhoids, or piles, and other natural fluxes, should be restored by applying leeches to the parts, and repeated warm fomentations. Diarrhœas and dysenteries ought to be treated according to their causes; and poison introduced into the stomach, should be remedied according to the rules given under the head of ANTIDOTES

When there is reason to suspect an inflammation, venesection will be necessary; but the quantity of blood drawn must be regulated by the strength of the patient, and the nature of the fever. The bowels should be opened by emollient clysters; or, if these prove ineffectual, strong solutions of pot-ash, in vinegar, ought, without delay, to be injected, and the abdomen rubbed with balsamic and antispasmodic embrocations, such as the camphorated liniment, mixed with an equal quantity of honey; or, in cases of extremity, the latter dissolv d in a strong decoction made of sage leaves and vinegar. If these remedies produce no relief, the smoke of tobacco may be intro duced by the rectum, and blisters applied to the abdomen. But, during the obstipation, no medicines should be used *internally;* as stimulating the stomach and bowels cannot fail to increase the inflammation, and thus endanger the life of the patient.

Inflammations of the bowels very commonly proceed, in the United States, from exposure of the body to alterations of heat and cold. The disease should be early attended to, and the progress of inflammation prevented, by, copious bleeding, and frequent clysters of cool water, in which Gla ber's salts have been dissolved; if these do not succeed in procuring stools, cold water must be dashed upon the feet, and clysters of tobacco in decoction, with antimonial wine, given This last remedy has succeeded, when a variety of others failed. *Med Com.* vol 6th.

Diseases of the Bowels in Horses. [The best remedy is purges and clysters, and if there be inflammation, bleeding.—T. C]

BOWLS, a game played upon a fine smooth grassy surface, used solely for the purpose, and denominated a bowling-green. The party may consist of two, four, six, or eight. The sides being selected by the throwing up of a coin, each player has two bowls, which are marked, so that all may know their own The leader sends off a smaller bowl called a jack, which he follows with his first bowl, getting as near the Jack as possible: he is then followed by one of the adverse party, and so on till all the bowls are played; as many of the bowls, on either side, as are nearer to the jack than the nearest on the opposite side, so many do the successful party score towards the game. Sometimes a ball laying very near the jack, is removed to a distance by the hit of an adversary's bowl, which remains nearer the jack than the bowl it has driven away: this is called a *rub,* hence the proverb "he that plays at bowls, must expect rubs."

BOXING, the art of fighting with the fists, which, among the Romans, were either naked, or inclosed a stone or leaden ball. Hence this exercise is very ancient, having been in vogue in the heroic ages

To the disgrace of England, the art of boxing, about half a century since, formed a regular kind of amusement, was encouraged by the first nobility of the kingdom, and even tolerated by the magistrates. About the time abovementioned, a booth was erected at Tottenham court, to which the public paid for admission the same as at a regular theatre, and the profits were divided among the combatants; the victor received two-thirds, and the remainder devolving to the loser In consequence of the inconveniencies sustained at TAYLOR'S booth, by the patrons of this refined art, Mr BROUGHTON, then the principal actor in these exhibitions, erected a more commodious amphitheatre near Oxford street. This barbarous amusement was at length neglected, though within these few years it has again engaged a considerable degree of the public attention; a fatal issue, however, which took place at one of the combats, again brought the practice into discredit. On this occasion, one of the combatants was killed on the spot; and his royal highness the PRINCE of WALES, who was present, declared, that on account of the dreadful example he had then witnessed, he would never again

be present at, or patronise another exhibition of a similar kind. Broughton was, however, honoured by being made one of the yeomen of the king's guards; and boxing in England has again become fashionable. [Of late years it has also been a very fashionable amusement with men whose station in society ought to lead them to suppress it.—T. C.]

Boxing also signifies the tapping of a tree, to make it yield its juice. This operation is performed on the maple, by making a hole in the side of the tree, about a foot from the ground, with an auger or chisel: from this juice or sap a good sugar may be extracted.

BOX-TREE, or *Buxus*, L. a genus of plants containing three species, namely, the *sempervirens*, or common box, with oval leaves; the *angustifolia*, or narrow-leaved box; and the *suffruticosa*, or Dutch box; the first of which only is indigenous. The two first-mentioned species, grow in great abundance upon Box hill, near Dorking, in Surrey, where there were for. [illegible] large trees of this kind. Of the first species, there are two or three varieties, which are propagated in gardens; and this, as well as the second, may be either raised from seeds or cuttings; the latter should be planted or sown in autumn, on a shady border.

Box-trees may be transplanted at any time, except midsummer, provided they be taken up with a good mass of earth, but the best time for their removal is October. The Dutch, or dwarf-box, is increased by parting the roots, or planting the slips: it should be intermixed with other evergreens.

The uses of the large kind of box are various: many articles of turnery, and musical instruments, are manufactured of its wood, which is of greater specific gravity than any other of European growth, as it will not float upon water. In Paris, combs are made of no other material than this wood: and the quantity imported annually from Spain into that city, is estimated at 10,000 livres. Box admits of a beautiful polish when made into articles of furniture, for which it is now much employed, as its bitter quality renders it secure from the attacks of worms.

It is asserted, that a decoction of box-wood rubbed on the head, will speedily restore the hair decayed in consequence of malignant fevers: but care should be taken in applying it, to prevent it from touching the skin of the face, which, in consequence of this embrocation, would likewise be covered with hair. A similar decoction has been recommended as a powerful sudorific, even preferable to Guaiacum; though, at present, neither the wood nor the leaves of the box-tree are used for medicinal purposes.

BRAIN, in anatomy, a great viscus in the cavity of the skull, of an oval figure, and larger in man, in proportion to his size, than in any other animal. It is a soft whitish mass, enclosed in the cranium or scull, encompassed with two membranes, called *dura mater* and *pia mater*, and divided into three principal parts: the *cerebrum*, or brain, strictly so called; the *cerebellum*, and the *medulla oblonga*. The *cerebrum* is supposed by most authors to consist of innumerable minute glands, destined for the secretion of animal spirits from the blood, and of infinitely fine fibres, communicating with the nerves. The *cerebellum*, or hinder part of the brain is esteemed a kind of little brain itself. Its substance is harder and more solid than that of the *cerebrum*, but of the same nature. The *medulla oblonga* or the medullary part, and the *cerebellum*, are joined in one, of which the spinal marrow is a continuation, whence originate most of the nerves of the trunk of the body.

The brain is uniformly considered as the grand *sensorium* of the body, or the organ of all the senses; and hence it is supposed, not without reason, to be the seat of the soul. The most important functions of an animal body are those of the brain. To afford a more distinct view of the subject, we shall mention a few experiments which have been made upon animals.

If the brain be irritated, dreadful convulsions take place all over the body. If any part of the brain be compressed, that part of the body which derives its nerves from the compressed part, is immediately deprived of motion and sensation. On compressing, tying, or dividing a nerve, the muscles to which the nerve proceeds, become paralytic. If the nerve thus compressed, tied, or divided, had before any particular sensation, it exists no longer, but on removing the compression, or untying it, its peculiar sense returns.

From these phenomena, it is evident, that every sensation in an animal body is derived from the brain, or from the spinal marrow, which is a continuation of the brain, and that it is conveyed thence through the medium of the nerves, to all parts of the sentient body. But, in what manner the various

sensations are produced by the nerves, and how the *will* operates upon the contiguous and remote organs, so as to put them into instantaneous motion, are difficulties which have never been satisfactorily explained, and, in all probability will always baffle the keenest investigation.

As the brain is the organ of the mind, its sound and perfect state is of the utmost importance in the exercise of the intellect. If, therefore, the brain of an individual be preternaturally soft, or too firm and hard, or specifically too light, or proportionately too small, or if it be in any manner compressed or shaken by external violence, or if acrimonious humour should settle on it, in consequence of various diseases; or, lastly, if in plethoric habits too great a portion of blood should flow towards the head, and too much extend its vessels;—in all these cases, the representing faculty will more or less partake of the disorder.—Thus the power of imagination, or fancy, is sometimes so much increased, that the patient is either in part, or entirely, deprived of the faculty of judgment. Such, for instance, is the case in delirious persons, who are then only called maniacs, when a total privation of their reasoning faculty is evident. In idiots, or stupid people, however, the mental disease arises chiefly from their incapacity of comprehending and properly arranging ideas.

The causes of these humiliating derangements of the human mind, though various, may be reduced to the following heads: namely, inordinate passions, especially those which are attended with a great dissipation of strength; debauchery of every kind, and irregular mode of life; excessive eating and drinking; intense, as well as long-continued application to study; and likewise, a sudden change of climate, air, and aliment.

It deserves to be pointed out as a vulgar error, that abscesses of the brain discharge themselves through the mouth and ears; and that snuff is liable to enter into the brain; neither of these is capable of passing through that bone, which has the form of a sieve; nor is any matter or fluid secreted in a common cold, evacuated by that canal, though discharged through the nostrils. The seat of this disease is, indeed, not in the brain, but in the cavities of the nose; and if imposthumes take place in the ear, they suppurate and empty themselves externally.

Inflammation of the Brain, is a disease more common in hot than in temperate climates; in the latter, however, it may also take place from external violence, or in consequence of severe falls, blows and bruises upon the head; night-watching; hard drinking; strong passions, especially those of grief, anger, and anxiety; exposure to the heat of the sun during sleep, with the head uncovered, &c The principal symptoms of this dangerous malady are, pain of the head, redness of the eyes, want of sleep, and slight dropping of blood from the nose; these are attended with costiveness and a retention of urine. As the disease, when neglected, is often fatal in a few days, medical advice should be called in without delay. Meanwhile, the patient ought to be kept as quiet as possible, and free from the access of strong light; his body must be kept open by clysters; the legs bathed in warm water; the bleeding of the nose promoted by warm fomentations to that part; and the head, after being shaved, should be frequently rubbed with vinegar and water; or cloths dipped in the following solution may be applied, and repeated every hour, or half hour, with the best effect. Take two ounces of nitre, and one ounce of sal ammoniac, dissolve them in five pints of water and half a pint of strong vinegar. Of this mixture the patient may also drink a table spoonful every hour, or oftener.

[It is now generally agreed, that all the species of insanity, are in fact bodily disorders; wherein the brain is either primarily affected, or indirectly by sympathy.—T. C.]

BRAKE is a large and weighty harrow used to reduce a stubborn soil. It consists of four square bulls, each side five inches thick, and six feet and a half in length. The teeth are seventeen inches long, and bend forward like a coulter; four of these are inserted in each bull, fixed above with a screw nut, having twelve inches free below, with a heel close to the under part of the bull, to prevent its being pushed back by stones. This instrument requires four horses, or the same number of oxen, and may be applied with great advantage in fallowing strong clay that requires frequent ploughings, as a breaking between each ploughing will pulverise the soil. In the month of March or April, on ploughing strong ground for barley, a cross braking is preferable to a cross

ploughing, and may be performed at half the expense.

A brake, with a greater number of teeth than that above described, is not proper for ground that is rendered adhesive by the roots of plants, such as land newly broken up: on the contrary, a less number of teeth would not sufficiently break the clods

BRAMINS, the cast or hereditary division of Hindoos peculiarly devoted to religion and religious science, in the same manner as, among the Jews, the priesthood was ordained to continue in the tribe of Levi. The families of this cast claim peculiar veneration from the rest, and seem, in their name of *Bramins*, to claim the merit of being the more immediate followers of Brahma, their incarnate deity. On the other hand, to maintain this character, they profess a peculiar circumspection over their conduct, and self-denial on many points wherein they allow indulgence to their less holy neighbours To speak of the religion of the *Bramins*, it is more correct to say the religion of Brahma, of whom the Bramins make part of the disciples. Of this system it is impossible to enter into particulars within a narrow space; and, perhaps, Europeans ought to confess themselves altogether incompetent to the task. In its morals, it often presents very amiable features; in its metaphysics, or at least in its attempts to describe the actions of the Creator toward mankind, its symbols are frequently absurd. How far these are the degeneracies of an ancient establishment, and the misconstructions of ignorance, it is by no means easy to say. It were too hasty a conclusion, however, to infer, that, in its institution, if not in its pure state at present, it was not founded on the basis of a praiseworthy morality and tolerably sound philosophy. Of the institutions of Brahma, that of the subdivisions of his disciples into perpetual casts, is the most striking, and most deserving of attention

BRAN, the husks of wheat, which when ground, are separated from the flour by a sieve. It contains a portion of the farinaceous matter, less glutinous than flour, and slightly detergent and purgative. Infusions of bran are often applied externally to cleanse the hands instead of soap; and it also removes scurf and dandriff

Bran may, in times of scarcity, be advantageously employed in the making of common household bread; this is effected by previously boiling the bran in water, and then adding the whole decoction to the dough: thus the bran will be sufficiently softened, and divested of its dry husky quality; while the nutritive part, which is supposed to contain an essential oil, is duly prepared for food. It is asserted, that the increase in the quantity of bread, by the addition of 14 lbs. 14 oz of bran to 56 lbs of flour, is from 34 lbs. to 36 lbs. of bread, beyond what is produced by the common mode. In one instance, 59 lbs of flour, with 14 lbs. 14 oz of bran, produced, on being weighed the next day, when cold, 106 lbs. and a half of bread; which is above half as much more than what is commonly made, and about twice the quantity obtained from a bushel of wheat, when merely the fine flour is used

Ten ounces of bran were boiled in somewhat more than two quarts of water, from fifteen to twenty minutes. The water was then strained off; and when of a proper degree of heat, 7 pounds of flour were wet with it in the usual way, with the common quantities of salt and yeast. The produce was, 12 lb. 10 oz. of bread. The same quantity of flour, made at the same time by the same person, and baked in the same oven, as bread is generally made, produced 9 lb. of bread.

[Bran is used to make water soft; to wash with sea-water; and by calico-printers, to clear the ground of their printed calicoes from superfluous colour.—T C.]

BRANCH, signifies the arm of a tree, which proceeding from the trunk, helps to form the head or crown thereof The same term is applied in genealogy and anatomy; thus we say the branch of a family, the branch of an artery, vein, &c

BRANCHIÆ, *gills*, in the anatomy of fishes, the parts corresponding to the lungs of land animals, by which fishes take in and throw out a certain quantity of water impregnated with air: hence we have the term,

BRANCHIOSTEGOUS, which denotes an order of fishes having gills without bony rays. Of these LINNÆUS made ten genera, which later naturalists have placed among the CARTELAGINEI, which see.

BRANDY, is a spirituous and inflammable liquor, obtained by distillation from wine. French brandies are accounted the best in Europe; and those of Bourdeaux, Rochelle, Cogniac.

Sharenton, &c. are held in the highest estimation Good brandy is clear, not too hot, nor sharp, and of a pleasant vinous flavour. French brandy acquires by age a great degree of softness, and at the same time a yellowish-brown colour, which our distillers have imitated in their artificial preparations. But this colour being found only in such brandies as have become mellow by long keeping, it follows that the ingredient, from which it is extracted, is the wood of the cask, and that the brandy in reality has received a tincture from the oak. The peculiar flavour which French brandies possess, is supposed to be derived from an essential oil of wine, mixed with the spirit; but, more probably, it originates from the very nature of the grape, or the wine lees. [The colour, however, is usually given by burnt sugar. T. C]

It deserves to be remarked, that our distillers frequently make use of the *spirit of nitrous æther*, commonly called dulcified spirit of nitre. a very small proportion of which, added to pure whiskey, or a liquor obtained by the distillation of malt, imparts to it a flavour not unlike that of French brandy.

Brandy and rum, even of the most genuine kind, are less wholesome than gin, malt spirits, or rye whiskey. The counterfeit and adulterated sorts are exceedingly detrimental to those who are habitually addicted to the use of this pernicious liquor. It should, therefore, be drank very moderately, rather from necessity than for gratification. When the stomach is empty, weak, and lax, a moderate dram excites a pleasant warmth and gentle tension; it is said to promote digestion, by dissolving the viscid phlegm which loaded that organ, invigorating its fibres, and stimulating its coats to act with more vigour. Yet all these good effects will not counterbalance the mischiefs done by an indiscreet and immoderate use of this cordial. Melancholy tempers, as well as choleric and sanguine habits, cannot fail to be injured by ardent spirits: and in short, a too free use of them in any constitution, is of the most fatal consequence. Hence, SYDENHAM, with great justice and propriety, exclaims, "Would to God brandy were totally abstained from, or used only on occasions to support Nature, and not destroy it, unless it were thought proper to prohibit any internal use of it at all, and leave it entirely to surgeons for bathing ulcers and burns" See also DISTILLING.

[Brandy has the property more than any other ardent spirit, of subduing venereal appetite, and the vital powers in this respect —T C]

One wine glass full added to a half gallon bowl of punch, highly improves the flavour of that drink. In Virginia, peach brandy has long been distilled, and might be made a very profitable article of internal commerce, as the peach-tree appears to thrive better in that state, than in any other in the union

Excellent brandy is made from apples in the United States, notwithstanding what CHAPTAL has said on the subject. If carefully distilled from sound apples, and kept a few years in a warm situation, it is very agreeable when diluted with water. Peaches also yield a liquor, which when properly distilled, is by many preferred to the finest French brandy.

[But all spirits distilled from fruits, are more decidedly unwholesome than those distilled from grain. The least unwholesome of ardent spirits are good old whiskey and gin. Spanish brandy, rum, apple whiskey, and peach brandy, partake of acid —T C.]

[Artificial brandy is made by running malt spirits through fresh charcoal, adding to each ten gallons a pint of tincture of bitter almonds and a sufficient quantity of colouring, and one fourth of good brandy of France.—T. C.]

BRASIL-WOOD, an American wood of a red colour, and very heavy, used in dyeing It grows naturally in the warmest parts of America. The demand has been so great that none of the trees are left in any of the British plantations; so that Mr. CATESBY owns himself ignorant of the dimensions to which they grow. The largest remaining are not above two inches in thickness, and eight or nine in height. The colour produced from this wood is greatly improved by a solution of tin in *aqua regia*

BRASS, in metallurgy, is a factitious metal, made of copper and zinc, or the ore of zinc, called *lapis calaminaris*. The French call it *yellow copper*. The Scriptures inform us, that the first formation of brass was previous to the deluge; but the use of it was not, as is generally believed, and as the Arundelian marbles assert, prior to the knowledge of iron. In the earliest ages, whose manners have been delineated by history, we find the weapons of their warriors invariably fra-

med of this factitious metal. Military nations were naturally studious of brightness in their arms: and the Ancient Britons, particularly, gloried in the neatness of theirs. Hence various nations continued to fabricate their arms of brass, even after the discovery of iron.

This substance, as is well known, is of a beautiful yellow colour, but varying in its shades according to the proportion of ingredients employed. It is more fusible than copper, and not so apt to tarnish: it is malleable when cold, but not when heated. The theory of Brass-making is this: mix together the oxydes of copper and zinc, and reduce them with a carbonaceous flux. The following are the proper proportions; 50 grains of oxyde of copper; 100 grains of lapis calaminaris; 400 grains of black flux, and 30 grains of charcoal powder. Melt the mixture in a crucible till the blue flame is seen no longer on the lid of the crucible, and when cold a fine button of brass is found beneath the scoria, weighing rather more than the copper alone obtainable from its oxyde without the calamine. Brass is so ductile that sieves of extreme fineness are wove with the wire, after the manner of cambric weaving

Brass colour, is that prepared by colour-men and braziers to imitate brass; of which there are two sorts: namely, the red brass, or bronze, which is mixed with red-ochre, finely pulverised; and the yellow, or gilt brass, which is made of copper-filings only. Both sorts are used with varnish.

Composition for imitating gilding on brass or silver—Take two ounces of gum-lac, two ounces of karabe, or yellow amber, forty grains of dragon's blood in tears, half a drachm of saffron, and forty ounces of good spirit of wine: infuse and digest the whole in the usual manner, and afterwards strain the whole through a linen cloth: when the varnish is used the piece of silver or brass must be heated before it is applied, by this means it will assume a gold colour, which is cleaned when soiled with a little warm water.

Corinthian brass, is a mixture of gold, silver, and copper; so called from the melting and running together of immense quantities of those metals when the city of Corinth was sacked and burnt, 146 years before Christ.

In 1781, a patent was granted to Mr. James Emerson, for his invention of making brass of copper and zinc. The patentee directs the zinc or spelter, to be melted in an iron boiler, then passed through a perforated ladle and placed over a vessel containing water; by which means the zinc will be granulated. Fifty-four pounds of copper shot are now annexed with 10 lbs. of calcined and pulverised calamine, together with about one bushel of charcoal: a handful of this mixture is first put into a casting pot, then 3 lbs. of the granulated zinc; upon which the composition before specified is laid till the vessel is filled: Mr. Emerson, however, has not stated the exact proportion of the ingredients. Eight similar pots are now to be supplied with the same materials, and the whole must be submitted to the heat of a furnace, for the space of twelve hours; when the process will be completed, and 82 lbs. of brass be procured; which the patentee asserts to be of a very superior quality to that manufactured from copper and calamine.

Various articles made of brass have sometimes an appearance of well gilt metal. This appearance, we now know, is produced by means of a solution of gum-lac and dragon's blood, in spirit of wine, with which they are rubbed. As long as the lac lasts, they retain their splendour. These articles, however, are attended with one inconvenience, that they must never be cleaned with a strong brush, or scoured with chalk or whiting, but only wiped with a soft rag; for, as soon as the lac is rubbed off, they lose their brilliancy. A varnish of this kind may be prepared in the following manner:

Dissolve two ounces of very pure and fine gum-lac in forty-eight ounces of alcohol, and place the solution in a sand bath exposed to a moderate heat. To prevent the too abundant evaporation of the spirit of wine, as well as the bursting of the glass, a piece of bladder ought to be bound over the latter, and a few holes made in it with a needle. In another glass, dissolve in the same quantity of spirit of wine, an ounce of dragon's blood in grains. When both the solutions are completed, mix them together, then put three grains of yellow wood into it, and suffer it to remain there twelve hours in a moderate heat: after which, strain the liquor through filtering paper, and preserve it for use in a clean glass bottle. To give this lac-varnish a high gold colour, yellow wood is preferable to every other substance. If the varnish is intended to be pale, and not to change

the colour of the brass, the yellow wood may be omitted, but if a stronger colour be required, a half more of the yellow wood may be added.

BRASSICA. See CABBAGE, COLEWORT, RAPE, ROCKET, and TURNIP.

BRAWN, is the flesh of a boar pickled or soused, which is always found to be better tasted, according to the greater age of the animal. The most approved method of preparing it is as follows: After the boar is killed, take the flitches only, without the legs, and extract the bones from them: sprinkle the flesh with salt; and lay it in a tray till the blood is drained off; let it then be salted a little more, and rolled up as hard as possible. The collar of brawn should be made of the whole length of the flitch, so as to measure nine or ten inches in diameter. The flesh thus prepared is to be boiled in a large kettle or copper, till it becomes tender enough to be pierced with a straw: then set it by, till it is thoroughly cold, and immerse it into the following pickle: To every gallon of water, put near two handfuls of salt, and as much wheat-bran: boil them well together; then drain the liquor from the bran as clear as possible; and when the liquor is quite cold, put the brawn into it.

BREAD, an important article of food, prepared of flour kneaded with a mixture of yeast, water, and salt, and afterwards baked in an oven.

Before the invention of mills for grinding corn, bread was prepared by boiling the grain, and forming it into viscous cakes, not very agreeable to the palate, and difficult of digestion. In process of time, machines were constructed for grinding corn, as well as for separating the pure flour; and a method was discovered to raise the dough by fermentation. Dough may be fermented either by *leaven* or by *yeast*; but as the latter raises the kneaded mass more uniformly, and produces the sweetest and lightest bread, it is generally preferred. Bread well raised and baked is not only more agreeable to the taste than unfermented bread, but more readily mixes with water, without forming a viscous mass, or puff, and is at the same time more easily digested in the stomach.

Bread, in England, is divided into three kinds, namely, white, wheaten, and household. Fine white bread is made only of flour; the wheaten contains a mixture of the finer part of the bran: and the household of the whole substance of the grain.

An act for regulating the assize of bread was passed in England, in the year 1773; by which it was enacted, that all bread made of the flour of wheat, and which shall be the whole produce of the grain, the hull thereof only excepted, and which shall weigh three-fourth parts of the weight of the wheat, shall be allowed to be made, baked and sold, and shall be understood to be a standard wheaten bread; also, that every standard wheaten peck loaf shall always weigh 17 lb. 6 oz. avoirdupois; every half peck loaf 8 lb. 11 oz and every quartern loaf 4 lb 5½ oz. and be marked with the letters S. W (standard weight) and that every peck loaf, half peck loaf, and quartern loaf, shall always be sold, as to price, in proportion to each other respectively.

[In England a quarter of wheat, or 8 Winchester bushels at 59 lb. per bushel, is said to make a sack of flour of 280 lb weight *fine* flour.—T. C.]

Although we have, in the article BAKING, given general directions for successfully conducting this complicated process, yet we think it will be useful, in this place, to add, by way of supplement, a few particulars relative to this subject, and more especially applicable to domestic purposes. Mr DOSSIE, who appears to have paid great attention to the art of baking, gives the following simple and much approved method of making good white bread. Take of fine flour, six pounds; of water, moderately warm, but not hot, two pints and a half; of liquid yeast, eight spoonfuls; and of salt two ounces. Put about a pint of the warm water to the yeast, and mix them well, by beating them together with a whisk. Let the salt be put to the remaining part of the water, and stirred till completely dissolved. Then put both quantities of the fluid gradually to the flour, and knead the mass well till the whole is properly mixed. The dough thus made, must stand four or five hours in a warm place; that is, till the exact moment of its being fully risen, and before it is sensibly perceived to fall. It is then to be formed into loaves, and immediately placed in the oven. To bake it properly, is attended with some difficulty to those who are not skilled in the art. The first care is to see that the oven be sufficiently heated, yet not to such a degree as to burn the crust. If a green vegetable turns black

when put in, the oven will scorch the bread; in which case it must stand open till the heat has somewhat abated. The next circumstance to be attended to is, that the mouth of the oven be well closed, till the bread has risen to its full height, which will not take place in less than two or three hours. After this, but not before, the oven may be opened for the purpose of viewing the bread, and seeing that it is baked without being either burnt or too crusty: for if the mouth of the oven be not kept closely stopt till the bread is fully risen, it will flatten and become heavy. When properly managed, the abovementioned ingredients will have lost about one pound two ounces in weight, so that a well-baked loaf of this kind should amount to seven pounds twelve ounces.

Bread may be made *without yeast*, as is practised in Hungary, by the following process: Boil two good handfuls of hops in four quarts of water; pour the decoction upon as much wheat bran as the liquor will moisten. [It will be the better for half a pint of coarse flour, and a table-spoonful of brown sugar.—T. C.] Then add four or five pounds of leaven; mix the whole together, till perfectly united. Put this mass into a warm place for twenty-four hours; then divide it into pieces about the size of a hen's egg: let these be dried in the air, but not in the sun, and they will keep good for six months. To make six large loaves, take six good handfuls of these balls, broken small and dissolved in eight quarts of warm water, and poured through a sieve into one end of the dough trough; then pour three quarts more of warm water through the sieve after it, and what remains in the sieve must be well expressed.

To make bread with salt. Take as much salt as is necessary to a loaf of the size intended, dissolve it in as much warm water as will mix the flour. Set it in a pot at a distance from the fire, sufficient to warm, but not to bake the flour on the side of the pot; a yellow water will rise on the top, which take off with a spoon, and the rising will begin. Then mix it with as much flour as will make the loaf, and if it should not be sufficient, add a little warm water; in less than an hour it will be fit to bake. From the time the salt water and flour are mixed, three or four hours are required. The mass does not rise like bread made with yeast.

One hundred pounds weight of flour will make from 134 to 138½ pounds of bread.

In an experiment made to ascertain the number of loaves of bread which a barrel of flour will produce, it appeared that 4 lb of flour produced 5 lb. 9 oz. of good light bread. This is an increase of about 40 per cent. Therefore a barrel of flour will make 272½ lbs. of bread, which will produce 312 loaves, weighing 14 oz and, at 6 cents, or one-sixteenth of a dollar, yield 19 dollars 50 cents.

A machine for kneading flour is used in the public baking houses at Genoa, and is calculated to save much labour. An account of this machine, together with a plate, may be found in NICHOLSON'S *Phil Journ.* and in the *Rep. of Arts*; taken from the *Trans of the Pat. Society of Milan*, vol 2.

Like all other farinaceous substances, bread is very nourishing, on account of the copious mucilage it contains; but if eaten too freely, it is productive of viscidity, which obstructs the intestines, and lays the foundation of habitual costiveness. Leavened bread, or such as has acquired an acidulated taste by a slow fermentation of the dough, is unwholesome. New baked bread contains a large proportion of indigestible paste, which may be rendered less unwholesome by allowing it to dry for two or three days, or by toasting it. This mode ought to be adopted, both on account of health and economy, especially in times of scarcity. Stale bread, in every respect, deserves the preference to that which is newly baked; and persons troubled with flatulency, cramp of the stomach, or indigestion, should abstain from new bread, and particularly from hot rolls.

Potatoes have also been made into bread, by different processes. The simplest is to choose the large mealy sort, boil them as for eating, then peel and mash them very fine without adding any water. Three or four parts of wheat flour, are added to one of potatoes, and a little more yeast than usual. The whole mass is to be kneaded into dough, and allowed to stand a proper time to rise and ferment, before it is put into the oven. Bread thus prepared is good and wholesome; and if bakers were to make use of no worse ingredients than this nutritive root, they might be justified in times of scarcity, provided they sold it at a moderate price, and under proper limitations.

M. PARMENTIER found, from a variety of experiments, that good bread

might be made of equal quantities of flour and potatoe meal. He also obtained well-fermented bread of a good colour and taste, from a mixture of raw potatoe-pulp and wheaten meal, with the addition of yeast and salt. [Bread with more than one-third of mashed and boiled potatoes is not palatable to me: 3 parts flour will bear with improvement one part of mealy potatoes.—T C]

Dr. DARWIN asserts, that if eight pounds of good raw potatoes be grated into cold water, and after stirring the mixture the starch be left to subside, and when collected, it be mixed with eight pounds of boiled potatoes, the mass will make as good bread as that from the best wheaten flour. He likewise observes, that hay, which has been kept in stacks, so as to undergo the saccharine process, may be so managed, by grinding and fermentation with yeast, like bread, as to serve in part for the sustenance of mankind in times of great scarcity. As an instance of the very nutritive quality of hay, it is mentioned, that a cow, after drinking a strong infusion of it for some time, produced above double the usual quantity of milk. Hence, if bread cannot be made from ground hay, there is reason to believe, that a nutritive beverage may be prepared from it, either in its saccharine state, or by fermenting it into a kind of beer.

Rice bread is made by boiling three-fourths of wheaten flour and one fourth of rice separately. The rice should be well boiled, the water squeezed out, (which may be afterwards used as starch for linen, for there can be no better) and the mass should then be mixed with the flour. It is made in the same manner as common bread, and is very nutritive. One pound and a half of flour mixed with half a pound of rice, will produce a loaf weighing from three pounds to three pounds two ounces, which is greater than that obtained by baking bread of wheat flour only. Rice has also been tried in the same proportion with barley, and makes good bread for labouring people; but the gain in baking is by no means equal to that obtained by mixing it with wheat. See RICE.

It is known that rice gains greatly in boiling; and hence, when made into bread with flour, is highly economical, as will appear by the following experiments: Six ounces of rice were boiled in a quart of water, till it was dry and soft; two pounds of flour were then added, and the whole, with two table spoonfuls of yeast, well worked into dough, together with the usual quantity of salt, giving it rather longer time to rise, which it was found it required. The loaf thus made, when baked, was light in quality, sweeter and more palatable than the common bread, and produced three pounds seven ounces and a half.

From this experiment the following fact appears, that rice gains in weight in a double proportion to that of any other grain. This will be further seen by the following statement.

	oz
2 pounds of flour, - -	32
Rice - - .	6
Bread produced	55½
Deduct per contra - -	38
Gained - - -	17½
To make a quartern loaf are generally used three pounds and a half of flour -	oz 56
When baked, is by standard to weigh four pounds five ounces eight drachms -	69½
Deduct as per contra -	56
Gained - -	13½

Therefore the difference is, that two pounds of flour and six ounces of rice, produce four ounces weight more than three and a half pounds of flour. Two pounds of flour, and six ounces of rice boiled till it was quite dry and soft, produced four pounds twelve ounces of excellent bread. One pound of flour, and three ounces of rice, wet with bran water, produced one pound twelve ounces of bread.

Another experiment. In doubling the quantity of rice to the same quantity of flour, which was found to answer for immediate consumption, but would not answer for general purposes; it may be safely concluded, that one-fifth of rice may be used with flour, to great advantage to the public, by increasing the subsistence, and with profit to the baker, who can afford to sell it at 1½*d* under the assize, and gain double what he does by baking the standard bread.

In making the foregoing experiments, it was proved, that nine-tenths flour and one tenth rice, and in the same way as directed for making bread (except using yeast and salt) produced a finer crust in pastry than using flour alone.

Bread thus made keeps longer moist than wheaten bread, and is better the second day than the first. Rice may be steamed rather than boiled; and if the quality of the rice is good, half a pound steamed in a little more than a quart of water, till it is quite dry and soft, gains two pounds, that is, four-fifths in weight.

French Bread is prepared in the following manner: Take half a bushel of the best wheaten flour, and dilute one pint of good yeast with three quarts of warm water; mix the whole properly, and cover it with flannel, till the sponge be formed. After the dough has sufficiently risen, six quarts of luke-warm skimmed milk, and one pound of salt, are to be worked in, with the fingers, till the sponge be weak and *ropy;* when it must again be covered, and kept warm. The oven being now made very hot, and the paste moulded into bricks or rolls, they are put in expeditiously: the former requiring one hour and a half; but the latter only half an hour. As soon as the bread is baked, it must be drawn; and, if burnt, the black crust should be rasped. When the milk is added to the sponge, two ounces of butter are sometimes incorporated: but this addition being immaterial, it may be omitted.

[For half a bushel of superfine flour, take the whites of eight eggs beat up into a froth, a quart of yeast, and as much warm new milk with an equal quantity of warm water as is necessary to make the dough. Make it into bread in the usual way.—T. C.]

The great advantage of eating pure and genuine bread must be obvious. Every part of the wheat, which may be called flour, was not only intended to be eaten by man, but it really makes the best bread, since that may be called the best which is of most general use, and so fine as to contain no part of the husks of the grain. But the delusion, by which so many persons are misled, to think that even the whole flour is not good enough for them, obliges them to pay a seventh or eighth part more than they need, to gratify a fanciful appetite. Had it not been for the custom of eating whiter bread than the whole of the flour will make, the miller and baker would not have employed all their art to render the bread as white as possible, and make the consumer pay for this artificial whiteness.

[Good flour imbibes ½ its weight of water, without letting it go again; flour of inferior quality, does not imbibe and retain so much. 7 lbs. of flour will make 9 lbs. of bread. Germinated grain, grain that has grown from the moisture of the season, or from accidental moisture, makes clammy unwholesome bread. Sir H. Davy observes that in making it into bread a small quantity of prussic acid is developed, as he judged from the peach-blossom smell exhaled. Such bread is certainly very unwholesome. To remedy the evil, 1st. Dry the grain in an oven: this stops the progress of the germination as in drying malt. 2d. With flour made of such damaged wheat, mix one half of good sound flour. 3d. With one pound of damaged flour, mix in fine powder from 30 to 40 grains of the common carbonate of magnesia: that is, uncalcined magnesia. The flour of *Barley* is very nearly as good as the flour of wheat and may be mixed half and half without injury. Ground *Indian-corn*, may be mixed with wheat in any proportion that suits the palate. *Oat-meal* may be mixed to the amount even of one half, and the bread will be wholesome and palatable. *Rye* the same. When carbonate of magnesia cannot be procured (as in many places of the back parts of our country) an equal weight (30 to 40 grains) of common whiting will answer the purpose of correcting the flour grown wheat: if that is not at hand, 25 grains of pot or pearl-ash, or a tea-spoonful of strong ley, may be used. Musty grain should be washed in boiling water.—T. C.]

New Substitutes for Flour or Bread. We have, in the preceding analysis, as well as on former occasions, mentioned various substances which might advantageously be employed in the manufacture of this indispensable article of human sustenance, independently of the different kinds of grain and roots that are already made subservient to this beneficial purpose. In order to exhibit a distinct view of the most promising substitutes, whether indigenous or exotic, and especially such as have actually been used on the authority of creditable evidence, we shall here divide them into three classes, and, in the course of the work, give a more particular account of each article, in its alphabetical order.

I. *Farinaceous Seeds.* Wheat-grass, or *Triticum Spelta;* Millet, or *Panicum miliaceum;* Common Buckwheat, or *Polygonum fagopyrum;* Siberian Buck-

wheat, or *Polygonum tartaricum*; Wild Buckwheat, or *Polygonum convolvulus*; Wild Fescue-grass, or *Festuca fluitans*; Maize, or Indian Corn, the *Mays Zea*; Rice, or *Oryza Sativa*; Guinea Corn, or White Round-seeded Indian Millet; the *Holcus Sorghum*, L. Canary-grass, or *Phalaris Canariensis*; Rough Dog's-tail Grass, or *Cynosurus echinatus*; Water Zizany, or *Zizania aquatica*; Upright Sea Lime-grass, or *Elymus arenarius*; Sea-reed, Marram, Helme, or Sea Matweed, the *Calamagrostis*, or *Arundo arenaria*.

The following mealy fruits, however, deserve a decided preference over many of the preceding: viz Water Caltrops, or the fruit of the *Trapa natans*, L. Pulse of various kinds, such as Peas, Lentils, Beans, and the seeds of the Common Vetch, Fetch, or Tare-acorns, and especially those of the *Quercus cerris* and *esculus*; the seeds of the White Goose-foot, Common Wild Orange, or the *Chenopodium album*; the seeds and flowers of the Rocket, or *Brassica eruca*; the seeds of the Sorrel, or *Rumex acetosa*; of the different species of Dock, or *Lapathum*; of the Yellow and White Water-lily, or the *Nymphoea lutea* and *alba*; of the Corn-spurrey, or *Spergula arvensis*; of the Spinage, or *Spinacia oleracea*, L. of the Common Gromwell, or Graymill, the *Lithospermum officinale*; of the Knot-grass, or *Paniculum aviculare*; the Beech-nut; the husks of the Lint-seed, &c

II. *Farinaceous Roots*: namely, those of the Common and Yellow Bethlem Star, or *Ornithogalum luteum* and *umbellatum*; of the Yellow Asphodel; of the Wake Robin, or *Arum maculatum* (after being properly dried and washed): of the Pilewort, or Lesser Celandine, the *Ranunculus ficaria*; of the Common Dropwort, the *Spiræa filipendula*; of the Meadow-sweet, or *Spiræa ulmaria*; of the White Bryony, or *Bryonia alba*; of the Turnip-rooted Cabbage, or *Napobrassica*: of the Great Bistort, or Snake-weed; of the Small, Welch, or Alpine Bistort; of the Common Orobus, or Heath Pea; the Tuberous Vetch; the Common Reed; both the Sweet-smelling and Common Solomon's Seal; the Common Corn-flag, or *Gladiolus Communis*; the Salt-marsh Club rush, or *Scirpus maritimus*, &c. Indeed, some authors also include in this list the roots of the *Mandragora*, *Colchicum*, *Fumaria bulb.*, *Helleborus aconitifol.* and *nigr.*, *Lilium bulbif*, and many others; but for these last mentioned we have not sufficient authority.

III. *Fibrous and less juicy roots*. viz. those of the Couch-grass; or Creeping Wheat-grass; the Clown's or Marsh Wound-wort; the Marsh Marygold, or Meadow-Bouts; the Silver-weed, or Wild Tansey; the Sea Seg, or *Carex arenarius*, *&c*.

[Every man, woman, and child of a family, consumes on the average eight bushels of wheat per annum —T. C]

The adulteration of Bread, by means of alum, may be considered as one lamentable source of the diseases of children, as obstructions in the bowels, rickets, &c. To discover such unlawful practices, requires no chemical skill: on macerating a small piece of the crumb of new-baked bread in cold water, sufficient to dissolve it, the taste of the latter, if alum has been used by the baker, will acquire a sweetish astringency. Another method of detecting this adulteration consists in thrusting a heated knife into a loaf before it has grown cold; and if it be free from that ingredient, scarce any alteration will be visible on the blade; but, in the contrary case, its surface, after being allowed to cool, will appear slightly covered with an aluminous incrustation.

BREAD-FRUIT-TREE, or the *Artocarpus*, L. a plant which grows in the South Sea Islands, and is remarkable for the size and nutritive quality of its fruit Although this tree has been mentioned by many voyagers, it was little noticed till the return of Captain Wallis from the South Seas. It grows in abundance on the Ladrone Islands. In the Society Islands, it is of the size of a middling oak; its leaves are about a foot and a half in length, of an oblong shape, deeply sinuated like those of the fig-tree, which they resemble in colour; and, when broken, exude a milky juice The fruit is shaped like a heart, and attains the size of a child's head. Its rind is thick, green, and covered with excrescences of a hexagonal figure The internal part of the rind is composed of a pulpy substance, full of twisted fibres: this pulp becomes softer towards the middle, where a small cavity is formed, containing no kernels or seeds. The inhabitants of Sumatra dry the soft internal part, and use it as bread with other food. At Amboyna, they dress the inner rind with the milk of the cocoa-nut, and fry it in oil like fritters. It affords much nourishment, is very satisfying,

and therefore proper for labouring people. Being of an astringent quality, it is also beneficial to persons of a relaxative habit. Its taste is rather harsh, and similar to the potatoe bread made in the West of England. The milky juice which issues from the trunk, when boiled with cocoa-nut oil, makes a very strong bird-lime.

From the investigations of botanists it appears, that this tree can only be propagated by suckers or layers, owing to a deficiency in the parts of fructification.

BREAKSTONE (Chickweed). See Procumbent PEARLWORT.

BREAM, or *Brama*, is a species of the *Cyprinus*, or carp It inhabits lakes, or the deep parts of smooth rivers, and affords sport to the angler, though it is not much esteemed for its flavour. The rules for catching this fish are nearly similar to those established for taking carp in general, which will be stated under the article CARP: the tackle, however, should be finer than what is commonly used for that fish; and the angler should throw his line as nearly as possible into the middle of the stream The bream may be taken with a blue-bottle fly, either by whipping, or in the common method, by paste or gentles.

BREAST, or fore part of the chest, signifies that cavity of the trunk which is composed of many bones, namely, the *sternum*, or breast-bone in front, twelve ribs on each side, twelve *vertebræ*, or turning joints of the spine, as the body is turned upon them, and two shoulder blades. The *thorax*, or chest, extends from the lower part of the neck to the midriff, and contains the organs most essential to life, such as the heart, the lungs, and likewise the wind-pipe, and the gullet. With respect to the diseases of the breast, we refer to the articles COUGH and INFLAMMATION.

BREASTS, or *mammæ*, in females, are two glandular, protuberant bodies on the sides of the chest, in the most proper situation for giving food to the infant. In some instances there have been found *three*, and even *four* breasts in one person, all yielding milk alike. They are very sensible to the touch, and ought therefore to be carefully guarded against external injury; as a very slight bruise or blow may be attended with fatal consequences. No part of the human body is so easily affected by cold, and so liable to cancerous complaints, as that of the female breast.—See CANCER.

Sore breasts are very common attendants upon lying-in women, and the source of infinite pain.—The most frequent cause of this complaint is a chill, induced by exposure of the body to draughts of cold air; by permitting the fire to go down during the night; or by not accommodating the quantity of clothing to the change in the air from heat to cold. A sudden fright has frequently been known to produce it. To guard against this truly dreadful complaint, attend to the prevention of the abovementioned causes; and by all means keep the *breasts well drawn*, either by the child or by a grown person. Nipple glasses may also be used for this purpose, but the mouth of a young person is much more effectual in emptying the breasts of the milk. A slight hardness of the breast will sometimes go off by gently bathing it for a quarter of an hour, twice a day, with a warm hand smeared with sweet-oil, and covering the part with a cabbage-leaf, which promotes perspiration, and thus relieves the vessels.—More threatening cases may be treated by anointing the breast with an ointment of the juice of the leaves of *stramonium* or *James-Town weed*, (commonly called Jimson). but the grand remedy, which will quickly disperse the most alarming swelling in the breast, is a *blister to the part*. Care must be taken to apply it smoothly, and to cause it to adhere tightly. A wide hole must be cut in the centre of the blister, for the nipple to pass through. Dress the sore with an ointment composed of equal parts of sweet-oil and spermaceti The breast must be drawn constantly during the whole course of the disease, and anodynes given occasionally. Should an abscess make its appearance, as it seldom or never can be dispersed, apply a poultice of bread and milk, with an onion cut fine in it, until fit to open, when a slight touch of a lancet in the most distended and depending part, will afford great relief, by discharging the matter. The poultices must now be continued, and the wound kept open, to permit a free discharge. Breasts will frequently heal and break out again and again. A hardness sometimes follows an abscess in the breast; this is effectually removed, by applying a little mercurial ointment, with a hand covered with a bladder, every night to the hardness, or rather below it.

BREATH, *fetid*, a misfortune to which many persons are liable, though they may appear to be in perfect health.

It may arise from various causes, the principal of which are, carious teeth, putrid gums, ulcerations of the lungs, or some peculiarity in the constitution of the individual.

If it originate from hollow teeth, care should be taken that no fragments of provisions, and especially cheese, remain in them after eating; hence the mouth ought to be washed, or properly rinsed, after every meal, with tepid water, or luke-warm camomile tea. A similar precaution is necessary, when the teeth are carious, or the gums in a flaccid and spongy state: but if the lungs, or other organs of respiration be diseased, due regard ought to be paid to the primary affection, of which we shall treat under the head of PULMONARY CONSUMPTION. In this case, as well as in some peculiar habits, where the real cause of fetid gums cannot be easily ascertained, the skill of the practitioner is frequently baffled; yet we shall venture to suggest a remedy which has, in a great variety of instances, been attended with the desired effect.—Many persons afflicted with that disagreeable complaint are, also, subject to habitual costiveness, which cannot, in general, be relieved without administering laxatives: these, by relaxing the bowels, ultimately tend to injure the constitution. On the other hand, we have observed from experience, that finely powdered charcoal, newly prepared, and kept in close vessels, has a remarkable tendency to open the bowels, without inducing an extraordinary degree of weakness, especially if it be mixed with the syrup of yellow roses. For this purpose, a table spoonful of each, diluted with a little water, should be taken two or three times every day, according to circumstances. Thus, if the patient abstain, for some time, from the use of animal food, the most distressing costiveness may be gradually relieved with perfect safety to the constitution; while the carbon acts on the whole system as the most effectual antiseptic with which we are acquainted. To increase the effect of this mild medicine, a tea-spoonful of squill vinegar may occasionally be added to each dose, together with a little cinnamon, or other aromatic water.

The best palliatives for sweetening an offensive breath, are gargles consisting simply of lime water, or a decoction of the Peruvian bark.

[The best preparation for cleaning teeth, is half vinegar and half water: lemon-juice may be substituted in part for the vinegar; but one half water is necessary.—T. C.]

BREATHING, is that alternate contraction and expansion of the lungs and breast, by which animals inspire and expire the surrounding atmosphere; a process essentially necessary to the support of life. From the moment a child enters the world the air penetrates into its lungs, which were previously filled with a watery mucus, but are then opened for the circulation of the blood. Thus respiration, one of the primary and most important of the vital functions, commences with birth, and is incessantly active; as it cannot be interrupted for many minutes, without endangering the life of the individual.

There have, indeed, been instances of persons wantonly endeavouring to restrain the act of breathing, nay, even to check the pulsation of the arteries, so as to exhibit a specimen of apparent death for several minutes We still remember the account of such a hazardous experiment, related by a most respectable professor in the *University of Edinburgh*, who informed his pupils, that a man possessing the talent here alluded to, at length paid the price of his life, by remaining in one of his exhibitions, a fatal example of his temerity

More frequent, however, though not so immediately dangerous, are the instances in which persons, in other respects sensible, unthinkingly expose themselves to situations, where they must necessarily breathe the most vitiated and pernicious atmosphere. Such is the case in all public assemblies, which are confined in narrow limits, particularly in theatres and other places of amusement to which numbers of spectators indiscriminately resort, and where each individual is obliged to respire part of the aggregate mephitic vapours of the company. Far from wishing to discourage the frequenting of those fashionable places of resort, in general, we only think it our duty to warn such invalids, as are liable to asthmatic or pulmonary complaints, against a too free indulgence in these enticing amusements. Indeed we are convinced, by numerous facts, of their deleterious influence: and if any person be disposed to doubt the propriety of this caution, let him reflect on the dreadful effects frequently produced by shutting up 5 or 6 passengers in a stage-coach, only during a short space of time; and he will acknowledge that

our admonition is well founded Hence we would advise those who lead a studious or sedentary life, never to continue for several hours together, in a close, and perhaps low apartment, where they admit the same air to re-enter the lungs, which has before been respired, and has become at length totally unfit for supplying the vital principle Thus, they deprive themselves of the most beneficial cordial of life, namely, *fresh air*, and exhaust the source of vitality as much in one hour, as was perhaps destined by Nature for the support of weeks, or even months Instead of following such an irrational practice, they ought either to remove to another atmosphere, or to open the window or door, to admit a supply of pure air, rather than to destroy themselves by an obstinate or indolent perseverance in their former habit

BREECHES, a part of the dress of most Europeans, worn by males. and reaching from the waist to the knees.

With respect to the construction of this article of our dress, it may be useful to observe, that if made too tight in the waistband, or of improper materials, they must necessarily occasion uneasiness, and prove injurious to the body. The form most to be preferred, and now very generally adopted, is that of pantaloons: these ought to be of a sufficient width, of a thin substance in summer, and of warm cloth in winter. Breeches made of leather and so narrow as to fit exactly the shape of the limbs, are liable to many inconveniences. they benumb the hips and thighs, occasion a painful pressure upon the parts, especially the abdomen; and by the close texture of the leather, in a great measure impede perspiration.

BREEDING *of Cattle:* As the different circumstances to be attended to in the management of cattle, will be stated when treating of the various kinds of useful animals, we shall here only observe, that the first thing to be considered is *beauty of form;* the next is proportion of parts, or what may be called *utility of form;* the third, which has engaged the attention of midland breeders, is the texture of the muscular parts, or what is called *flesh;* a quality which however familiar it may have been to the butcher and consumer, has not in general been attended to by breeders In short it is a rule applicable to all sorts of live-stock, to breed from straight backed, round bodied, clean, small boned, healthy animals: carefully rejecting such as have roach backs and heavy legs, with much external appearance of offal, &c.

To the late Mr. BAKEWELL, of Dishley, who was undoubtedly the most scientific breeder of his time, we are indebted for many new and important improvements in the art of breeding cattle. His principle was, to procure the best beast, that would weigh most in the valuable joints; and thus, while he gained in point of shape, he also acquired a breed much hardier, and easier fed, than any other.

With respect to the breed of oxen, Mr BAKEWELL asserts, that the smaller the bones, the more perfect will be the make of the beast, and the quicker it will fatten. The breed preferred, and considered by him as the best in England, is that of Lancashire The shape which should be the criterion of a cow or bull, an ox, or a sheep, is that of a hogshead or a firkin, with legs as small and short as possible He found from various experiments in different parts of the kingdom, that no land is too *bad* for a *good* breed of cattle, and particularly of sheep The great advantage arising from his breed is, that the same quantity of food will suffice them much longer than it will any other kind, besides which, the wool is of the finest quality, and the sheep stand the fold perfectly well.

The wintering of cattle, also received particular attention from this professional breeder; his horned beasts were tied up during the winter, in sheds, and fed with straw, turnips or hay; all the lean beasts were fed with straw alone, and lay without litter Young cattle, that require to be kept in a thriving state, are fed upon turnips; and as the spring advances, and this vegetable becomes scarce, hay is their only food.

The floors, on which the cattle stand, are paved, and raised six or eight inches above the level of the yard; and each crib being only broad enough for a beast to stand on, its dung falls on the lower pavement, by which contrivance it is kept perfectly clean without litter. See CATTLE.

Little attention has been paid to the preservation of a good breed of cattle in the United States. Some with excellent qualities, have been imported, and are occasionally met with; but they are in general fattened and killed, instead of being carefully preserved for breeding cattle But this is not the way to improve. It was by a practice directly the reverse that BAKEWELL

brought his breed to unrivalled celebrity.

Some attempts have been made near Baltimore, and in the state of New York to improve the breed by an imported stock. Will these meritorious gentlemen who are making the experiments, inform us of the breed, the qualities of the animals, and the success that has attended their well meant efforts?

Droves of cattle are annually brought to Philadelphia from New England and North Carolina. The former are larger and more profitable than the latter, which are generally small, and wild from having been fed in the woods.

Several very large cattle have been fed and killed within a few years in Philadelphia. They have in general been raised in New Jersey, but whether from a native or imported stock is unknown. The following are the weights of a few of these beasts:

1 A cow raised by the late Mr. Hiltzheimer, of the city of Philadelphia, and killed on the 2d of March, 1787.

The fore-quarters weighed (one) - - -	326 lbs.	
The other - -	328	lbs.
		654
The hind-quarters weighed. (one) - -	282	
The other -	289 - - -	571
The nett beef - - - - - - - -		1225
The Hide weighed	111	
Head and heart	49	
Belly and Feet	72	
Fack	35	
Tallow	163 - - - -	430
Entire wt. (exclusive of guts)		1655

2 A five year old steer, fed by Mr Sickle, of Philadelphia, a few years since, one summer, and one winter, weighed alive, 1,494¾ lbs.

The belly fat - - - - - - 278
Kidney do., - - - - - - - 100

3. Ten head of cattle, fed by the same gentleman, produced 2,439 lbs. of belly and kidney fat, with one summer feeding on grass.

4 A steer raised at Tulpohocken, was killed on the 12th of March, 1787, weighed alive, 2,184 lbs.

5. A steer raised at Haddonfield, New Jersey, killed at Philadelphia, on the 7th April, 1787, weighed alive, 2,140 lbs.

Formerly a great prejudice prevailed in favour of large beasts, but it has been ascertained that this large big boned breed is not so profitable as the *middle sized, barrel shaped, short legged kind.* Much may be done towards improving the breed, by a careful attention to stock Mr Bakewell and his disciples relied upon a *kindly skin,* as a principal point in the choice of a beast. By that is meant a skin that feels soft, though firm to the touch, which is equally distant from the hard dry skin, peculiar to some cattle, as from the loose and flabby feel of others.

Some breeds have a tendency to generate fat on certain parts of the body in great quantities, while others have it more mixed with the flesh of every part of the body These particulars demand the attention of improvers

It is said that cattle having fore-quartiers heavier than their hind, require more food than others. Is this the fact?

BREEDING *of Fish* The necessary qualities of a pond for breeding fish, are very different from those which are requisite to make it serve for their nourishment. A good breeding pond is more rare to be met with than a good feeding one. The best indications of the former, are plenty of rushes and grass about its sides, with gravelly shoals, like those of horse-ponds. The quantity of the spawn of fish is prodigious; and where it succeeds, one fish may sometimes produce millions. Hence two or three melters, and as many spawners, placed in such a pond, will, in a short time stock a whole country. If it be not intended to keep these ponds entirely for breeding, but to let the fish grow to a considerable size, their numbers should be thinned, or they will otherwise starve each other. Different kinds of fish may also be added, which will prey upon the young, and prevent their increasing in number. For this purpose, eels and perch are most useful, because they not only feed upon the spawn itself, but also upon the young fry.

Some fish will breed abundantly in all kinds of waters; of this nature are the roach, pike, perch, &c. See Fish.

BREEDING, *Good:* an expression which is used to denote the proper deportment of persons in the external offices and decorum of social intercourse.

Good breeding necessarily implies *civility,* though a person without being well bred, may be civil; the one is the result of good nature, the other of good

sense joined to experience, observation, and attention.

The most perfect degree of good breeding is only to be acquired by great knowledge of the world, and keeping the best company. To attain this desirable object we would advise parents not to suffer their children, after a certain age, to spend the greatest part of their time among servants, or menial dependants, from whom neither good language nor proper manners can be expected, and who seldom fail to instruct the susceptible young mind in all the low cunning, and artifices of the vulgar. Good breeding adorns and enforces virtue and truth; it connects, it endears, and while it indulges the just liberty, restrains that indecent licentiousness of conversation, which alienates and provokes Great talents render a man famous; great merit procures respect; great learning, esteem; but good breeding alone can ensure love and affection. Hence it deserves to be peculiarly recommended to women, as the greatest ornament to such as possess beauty, and the safest refuge for those of a contrary description. It facilitates the conquests, and decorates the triumphs of beauty; while, on the other hand, it atones, in some degree, for the want of that quality. On the whole, good breeding is attended with so many advantageous effects, that, though it cannot be called a virtue in itself, it may be justly considered as one of the most pleasing and useful accomplishments; insomuch, as it has a direct tendency to check the violence of all the turbulent passions, and to render the path through life more comfortable and easy.

BREWING, the art of preparing beer or ale from malt, by extracting all its fermentable parts in the best manner; by adding hops in such proportions as experience has shewn, will preserve and meliorate the extracts; and by causing a perfect fermentation in them by means of yeast or barm. The goodness of the beer will depend on the quality of the malt from which it is made; on the peculiar properties of the water with which it is infused; on the degree of heat applied in the mashing; on the length of time the fusion is continued; on the due manner of boiling the wort, together with the quantity and quality of the hops employed; and on the proper degree of fermentation: to ascertain all which particulars, with precision, constitutes the great mystery of brewing, and can only be learnt by experience and repeated observation.

Mr Mills, in his "*System of Practical Husbandry*," and Mr. Combrune, in his "*Theory and Practice of Brewing*," give the following directions for the choice of materials used in brewing, and for conducting the whole process:

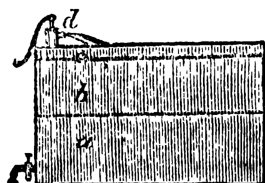
1 *Of the Water.* Pure rain-water, as being the lightest, is esteemed the most proper Well and spring waters are commonly hard, and consequently unfit for drawing the tincture completely from any vegetable. River-water, in point of softness, is next to rain-water; and even pond-water, if pure, is equal to any other for brewing.

2 *Of Malt.* In order to ascertain the quality of this article, bite a grain of it asunder, and if it tastes mellow, and sweet, breaks soft, and is full of flour from one end to the other, it is good; which may also be known by its swimming on the surface, when put into the water. The best way of grinding it, is to bruise it in a mill composed of two iron cylinders. These break the malt without cutting its husk, so that the hot water instantly pierces its whole substance, and soon draws forth a rich tincture, with much less mashing than in the common way.

3. *Of Hops.* Experience has proved, that hops slack-dried; or kept in a damp place, are pernicious ingredients for making beer; and likewise, that they yield their aromatic bitter more efficaciously, when boiled in wort than in water. hence, to impregnate the extracts from malt with a due proportion of hops, their strength, as well as that of the extract, should previously be ascertained. The newer the hops are, the better they always prove; the fragrance of their flavour being in some degree lost by keeping, notwithstanding the care used in preserving them. Private families, who regard only the flavour and salubrity of their malt liquors, should use from six to eight bushels of malt to the hogshead of their strongest beer. The quantity of hops must be suited to the taste of the drinker, and to the time the liquor is intended to be kept. From two to three pounds will be sufficient for a hogshead, though some go as far as six pounds. Mr. Mills is of opinion, that *small beer* should always be brewed by itself; in which case, two bushels and a half of malt, and a pound and a half of hops, are sufficient to make a hogshead. [In America the barley is for the most part very inferior to that of

England, and therefore it will be necessary to add at least one fourth in quantity of malt to the English proportions.—T. C]

4. *Of the Vessels used in Brewing.* The brew-house itself, and every vessel in it, ought to be perfectly clean and sweet; for if the vessels are in the least degree tainted, the liquor put into them will contract a disagreeable scent and taste. A vessel of the most simple and excellent contrivance, among the multiplicity of brewing utensils adapted to family purposes, is that of Mr J. B. Bordley, who has described it in his "*Essays and Notes on Husbandry and Rural Affairs.*" (*Philadelphia* 1801.) He terms his process, by way of distinction, *a tripartite method of brewing;* because the *kettle-apparatus*, represented in the subjoined cut,



is worked in *three* divisions. The whole vessel is 40 inches long, 20 broad, and 24 deep; namely, division *a*, is thirteen; *b*, nine; and *c*, two inches deep. The dotted lines are marked, where the perforated moveable bottoms are placed. In *a*, is the *water* or *wort;* *b* contains the *malt;* and into *c*, the hot water is pumped up, or poured over from a to *c*, by means of the small pump, *d;* and thus passes through every particle of the malt; so that, by frequent agitation, the water in a manner washes out its whole substance, and extracts all its farinaceous and saccharine ingredients. This operation is repeated, occasionally stirring up the grains, till the liquor becomes clear, (when it must be let off into a kettle and boiled with hops, the proper proportion of which must be determined by experiment; it must afterwards be let out into coolers.) Mr. Bordley, ingeniously acknowledges, that a Swedish method of brewing in camp afforded him the hint for this invention. He also observes, that his tripartite kettle is made of copper, and the small pump of *metal;* though we are inclined to think that, for the latter, wood, or *pure tin*, would be preferable to brass, in order to prevent the formation of verdigris. At the bottom is a cock on one side of the vessel. On the whole, we consider this as a convenient piece of machinery, for family brewing.

5. *Of the heat of the water for Mashing.* Particular care should be taken, that the malt be not put into the water whilst boiling hot. In order to bring the water to an exact heat, Mr Combrune advises us, to put on the fire 22 quarts, gallons, or barrels, according to the quantity wanted; and when it has just arrived at the boiling point of the thermometer, to add ten similar measures of cold water, which, when mixed with the former, will be of a temperature not exceeding 161°* of Fahrenheit: and this he considers as the most proper heat for mashing He farther remarks, that water which has endured the fire the shortest time, provided it be hot enough, will make the strongest extract.

6. *Of Mashing.* When the water is brought to a due heat, the malt is to be put in very leisurely, and uniformly mixed with it.

7. *Of boiling the Wort.* As the design of boiling the wort is to clear the liquor of its impurities, and to obtain the virtue of the hop, a much shorter time than usual is sufficient. Long boiling of the hop is a most pernicious practice, and produces an austere, nauseous bitter, but not a pleasant aromatic one Instead of adding the hops to the wort, when this is put into the copper, or before it boils, they may be infused about five minutes before the wort is taken off the fire: if this is not sufficient to give the desired degree of fragrant bitter, ten minutes may be taken, or as much longer as will be found necessary. Mr. Mills prefers putting the hops to the wort towards the latter end of the boiling, rather than at the beginning, because the continued boiling of the liquor is apt to dissipate their fragrance.

[An infusion of the hops for an hour in a *close* vessel with water heated to 200 at first, adding this about ¼ of an hour before the boiling of the wort is finished, would be an improvement.—T. C]

8 *Of Fermentation.* One gallon of yeast, in the coldest fermenting wea-

* [It may be put safely as high as 170°.—T. C]

ther, is, according to Mr. COMBRUNE, sufficient to ferment the extract from one quarter of malt; and, if properly managed, will yield two gallons of yeast. Great care should be taken in the choice of yeasts, as they are liable to be soon tainted, and very readily communicate their infection to the liquors fermented. The whole process of fermentatton should be carried on in the slowest and coolest manner; so that the temperature, which at the commencement was between 40 and 50° of Fahrenheit, should very gradually be raised to the 70th degree. (This is proper for a large quantity; but for a small, 66 is the best.) Fermentation will always succeed best where the air is purest. If too hot water has been employed for obtaining strong and fatty extracts, from the malt, fermentation will be retarded: on the contrary, in weak extracts, it is so much accelerated, that the whole soon becomes sour. When the fermentation is at its height, all the feculent matter, or foul yeast, which rises on the surface must be carefully skimmed off, whatever be the quality of the liquor. The beer, as soon as it is tolerably clear, should be racked off into perfectly clean and sweet casks; and when managed in this manner, will remain a long time in a state of perfection.

9. *Of fining the Liquor.* As the excellency of all fermented liquors depends, in a great measure, on their transparency, it often becomes necessary to resort to artificial means, in order to bring them to this state of perfection, if the process of fermentation has been mismanaged. Thus, a solution of isinglass in stale beer, is used to fine and precipitate other beers: but, as this method has proved ineffectual in brown beers, we are informed by Dr. COMBRUNE, that brewers, "*sometimes put one pound of oil of vitriol* into *one butt*, though four ounces should never be exceeded in that quantity." On this subject we have no hesitation in saying it is a most culpable and deleterious practice.

10 *Of the distempers of Malt Liquors.* Among the distempers incident to beer, one, which has been found most difficult to cure, is that of its appearing ropy. A bunch of hyssop put into the cask will, however, effectually remedy this evil. A satisfactory account of the different methods of recovering *flat*, *tart*, or *sour beer*, having been already given in this *Encyclopædia*, it would be superfluous to repeat it in this place.

It deserves to be remarked, that *brown* beer, made from well dried malt, is, in the opinion of Dr COMBRUNE, less heating than *pale* beer, brewed from slack-dried malt. If extracts from pale malt be made with very hot water, they will keep sound for a long time; but those obtained from brown malt, with too cold water, will frequently turn sour.

[Family brewing, and brewing in small quantities.

An establishment for a moderate family may be thus:

A Brew-house 20 feet by 15 on the ground plan. A COPPER with a brass cock at the bottom; to hold not less than 40 gallons, to be set high." A MASH-TUN to hold twice as much as the copper, for the malt will occupy when wetted as much space as the water. The mash-tun should stand a little below the level of the cock of the copper: so that the water of the copper can run into the mash. The mash-tun should have a false bottom on which the malt is placed, this should be bored with ¼ inch holes, at about 3 inches distance; the depth between the solid bottom and the false moveable bottom 6 inches. A cock or plug should be fixed between the two bottoms, to let off the wort into the UNDERBACK; this should hold as much as the copper.

From the under-back, the wort is pumped up into the copper, to be boiled: when boiled, it is let into the COOLERS: Of these there should be two, each to hold 45 gallons. They should be placed one under the other, and a little below the level of the cock of the copper; that is, on a level with the top of the mash tub. The wort, when boiled, is to be let off into the first cooler, and then into the cooler underneath; whence it runs into a working tun of the same size as the mash-tun: for though not more than 32 or 33 gallons of wort runs in at a time, yet the head, produced during the working or fermentation, will occupy a considerable space. The coolers should not be more than six inches deep. Thence the establishment of utensils will be,

A copper of 40 gallons, or 45.

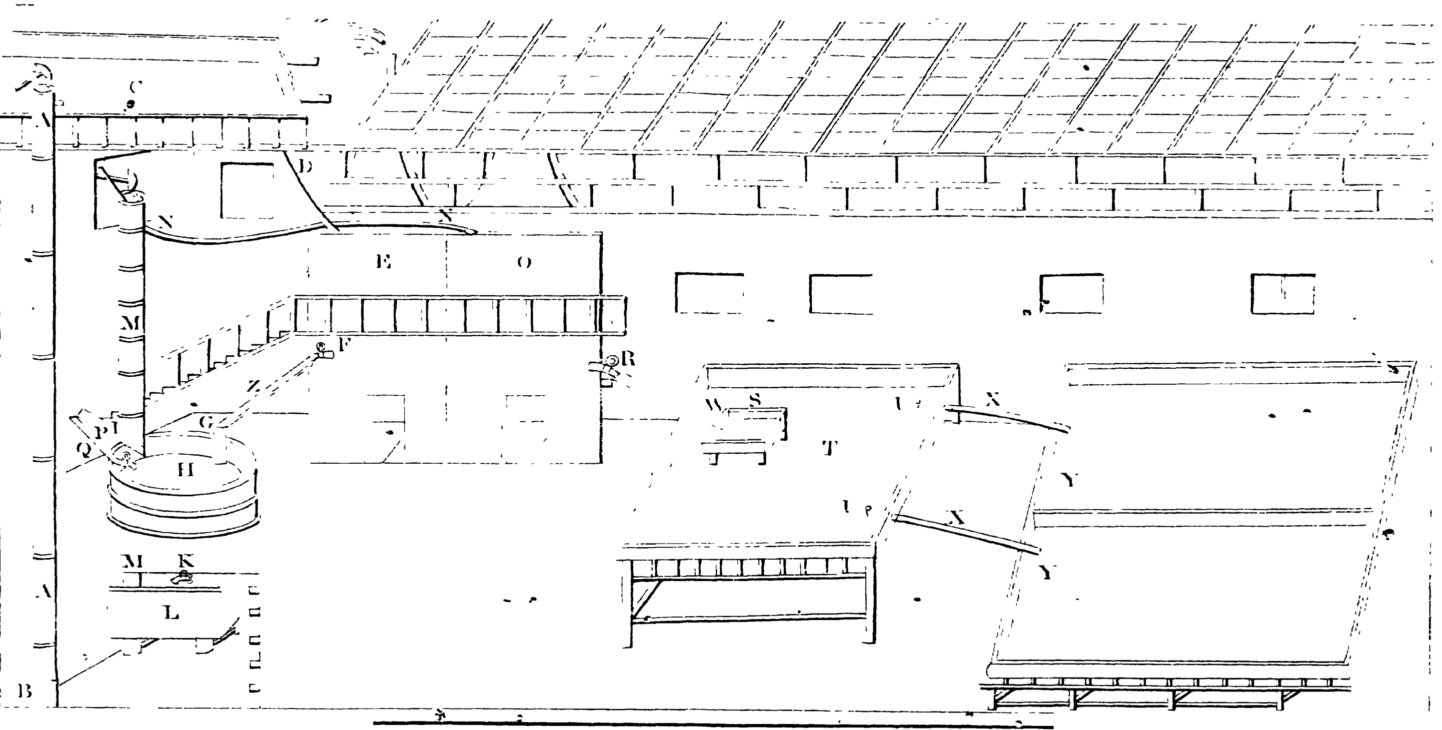
A mash-tun of 80 gallons.

An under-back of 40 gallons.

A working-tun of 80 gallons.

Two coolers six inches deep to hold each 40 or 45 gallons, 6 feet by 2 feet 6 inches each.

A hand pump to pump the wort into the copper, unless it can be done by the water pump.



View of the inside of a Brewhouse.

Pails, Bowls, &c.

A stilling, to set the casks on when full, about ten inches high, and 14 inches wide in the clear. Four rum puncheons sawed through the middle, would answer tolerably well for almost all the utensils. One bushel of malt and 1 lb of sugar will make one barrel of good table-beer, of strength between ale and small-beer, if the first and second worts are boiled and mixed together This, exclusive of trouble, will not cost above $\frac{1}{16}$ of a dollar a gallon. The Brew-house should be placed on the north side of the buildings; it should be open on three sides to let in air, and let out steam; the three open sides should have hooks fixed to them, so as to hang on flap-boards, or slanting battens to keep out the wet. But there are many small families, who cannot afford such an establishment; these may brew in small quantities as follows:

Every family has a large kettle or vessel to boil their clothes in; suppose this to contain about 3 gallons, this will serve for a copper. A common pail with a hole bored through the bottom, and set upon a stilling or some other contrivance to raise it, another pail may receive the wort, and may answer for a fermenting tun, and when the beer has worked so as that the head begins to fall, draw it off into a five gallon keg.

Proportions for 5 gallons of ale.

Malt 1 and ½ peck; of sugar ½ lb. hops ¼ of a lb. malt amber coloured, or pale dried.

Proportions for 5 gallons of porter, brewed in that quantity

Malt 1½ peck; sugar made into essentia* ¼ lb. molasses ¼ lb. hops ¼ lb. ginger about a tea-spoonful. The malt to be high dried, or else half amber and half high dried.

These proportions, used according to the foregoing directions, will produce a good wholesome liquor, that the women of the family may brew occasionally when they have not much else to do.

Of the Brew-House. The following is an eligible construction where brewing is followed as a trade "The cold liquor† pump A, A, raises the water from the river or well B, which, as well as the wort pump M, M, is driven by a horse with proper machinery, which likewise grinds the malt used in the brew-house. The grinding house is situated between the pumps, as may be seen by the mill-spout P, which conducts the malt from the mill into the mash-tun H. The liquor from the river B, is pumped into the cistern or reservoir C, where it is ready at all times during the hurry of brewing; and from the cistern it passes through the large pipe D, into the liquor copper, E, where it may be stopped by a cock at the extremity of the pipe The liquor when warmed for mashing is let into the mash-tun H, by opening the cock F, in the bottom of the copper, and runs down the trunk Z, which carries into the raising spout G, in the mash-tun H, this spout by a notch in the moveable or false bottom of the mash-tun, conducts the liquor between the moveable and real bottoms, which, by ascending, assists the mashing very much.

"The extract or wort is let go, by turning the cock K into the under-back L and is from thence carried by the horse-pump M M. into a level with the wort copper O and runs from the pump through the pipe N. N into the wort copper.

"When cold liquor is required for mashing, as is the case in small beer brewing, it is obtained from the cistern C. by the pipe Q. which communicates with it

"Thus these three very laborious parts of the business, viz pumping the liquor from the river or well; mashing, and pumping up the worts into the copper, may be easily performed by two men: and they are able to mash a very considerable quantity of malt, and attend to the steaming of the casks, liquoring the backs, &c. between the mashes. When all the worts are in the great copper O, and are boiled sufficiently, they are run off into the first back T. by turning the cock R the spout W. conducting the worts from the drainer S. which detains the hops. This back communicates with the two large backs Y. Y. which are sufficient to contain all the worts, and they may be laid at a greater or less depth, by using one or both these backs, stopping either of the pipes X by putting in one of the plugs U U The situation of these two backs is higher than the fermenting tuns, and by pipes the worts are conveyed into them below: and if

* [Essentia, is sugar dissolved in water and evaporated till it becomes a dark brown bitter substance.—T. C.]

† Brewers call water, whether warm or cold, *liquor*. It is a fine among them to use the term, water.

there is conveniency, the tuns, when cleansing,* ought to be high enough to fill the casks in the cellars by means of a leathern pipe."

OF BREWING.—Take care that every utensil is made perfectly clean.

Boil your liquor (water); when boiled, reduce it to about the temperature of 170 of FAHRENHEIT's thermometer. If the malt is newly ground, do not let the water go on, till it is reduced to 165°.

If you have no thermometer, there are three rules which may serve tolerably well. [But it is hardly to be expected that any person now, will attempt to brew without a thermometer.—T. C.]

1st. Let the boiling water be mixed with cold water, till you can perfectly see your face in it; or, 2dly, till it will just scald your finger, unless you take it out immediately. Or,

3dly. Add in winter, 2 gallons of cold to 16 of boiling, and in summer 2 gallons of cold to about 12 of boiling water, if you use rain or river water; for of these the temperature varies with that of the atmosphere. If you use well water, 1 gallon to 16 for your first wort throughout the year will be about enough. Never use rain water, where the washings of the roof give it a bitter taste.

Your first wort will require about twice as much water as the two succeeding; for the malt imbibes and retains about one half of the whole quantity: never let the malt stand dry in the mash-tub. When the water is risen through the holes of the moveable bottom sufficiently, pour in your malt, and let a man stir it about with a rake while you pour it in. When the malt is thoroughly wetted, stir it up with the oars, and raise the malt repeatedly from the bottom, and beat it about; this should be done for a quarter of an hour or 20 minutes. Then sprinkle some dry malt over the top, cover it with a cloth or mat to retain the heat, and let it remain 3 hours in winter, and 2 in summer. Then run it off: pour back the first runnings if they are muddy. A handful of hops put into the vessel in which the wort runs, is advantageous, particularly in summer; preventing the liquor from turning sour.

While this first mash is about, fill your copper again, and boil the water for the next mash, which may now be at 185, or 15 degrees hotter: rake and beat this as before, and let it stand one hour. For the third mashing, use water at about 190; let it stand also an hour: it is convenient to finish mashing by evening, in order to gain the coolness of the night for the wort.—When all the wort is extracted, put them together and boil them till you get the quantity you mean to have from the malt. The boiling should be quick and fierce: the hops should be wetted and then broken in among the worts. The worts may boil from an hour to an hour and a half: the copper should have a sloping rim.

The strength of the worts, and of consequence of the liquor, may be ascertained by an hydrometer; a mode first suggested by RICHARDSON, in his treatise on brewing.—Thus, if a Florence flask, filled with water, accurately, up to a mark in the neck, weighs 2 lbs. for instance, the same flask filled with wort properly boiled for ale, and ready to be let off into the cooler, will weigh more. When you have once ascertained the weight of the wort which will make good ale, you may always know in future when your wort is sufficiently boiled; for little evaporates but steam of water *impregnated with the oil of the hops*. When boiled, turn the worts into the coolers, and the instant they are cool enough, put them to ferment. Otherwise, especially in summer, they are apt to *fox*, as it is called; that is, they acquire a reddish colour and a disagreeable flavour.

They are cool enough at 45 or 50, that is, for a large brewing, but for smaller brewing 60 to 62 degrees will be proper, and in family brewing 66 to 70, and in very cold weather 76° will be the right temperature. FAHRENHEIT's scale is alluded to.

In winter, allow one gallon of yeast to the quarter of malt: in summer half a gallon. In winter put in the yeast at once, in summer one half at first, or when the tun is about half full of wort, and the other half when the beer is fit to be cleansed, (that is, filled up with wort.) When the wort begins to cream, stir it about and mix the yeast well with the liquor. In winter the beer should be cleansed when the head or froth is just beginning to become solid and thicken. In summer, as soon as it begins to shew a white head.

Generally, when the head becomes brown, solid, and of a yeasty consistence, and seems just ready to fall back into the liquor, the beer should be put

* Cleansing means filling the casks from the fermenting tub.

into the casks. Never suffer the head to break. Better fill the casks a few hours too soon than one hour too late. Strong beer, if brewed in small quantities, and ale in any quantity, should be tunned the second day.

The casks, when well cleaned with hot water, (and if necessary also with lime or ashes to neutralise the acid absorbed by the wood,) should be filled and put upon the stilling, or frame of about 12 inches high.

Fill up the casks as they work over, once every hour, for the first 6 or 8 hours: be sure to keep the casks filled till the fermentation has entirely subsided, which will be in a few days.

Place vessels under the casks to collect the workings over, and the casks may be filled up with the CLEAR part of these workings. Take great care to keep your cellar dry, and free from the drippings of the casks: if the cellar be damp and musty, your beer will be in hazard of smelling.

When the beer has worked in the casks, bung it and remove it, if necessary; to the place where it is to remain: then draw the bung, and fill up with clear beer, scumming off the sediment that may be thrown up by rolling. Bung the casks tight; bore a vent hole, and put in a vent peg, which should be rather slack while the beer is observed to be on the fret. If it runs out at the vent hole, draw off about a quart, to give it room and prevent the starting of the wood.

When beer is drawn, take care never to leave the vent peg out, or loose: the best liquor may soon become flat and vapid by the carelessness of servants in this respect.

Take care also that the sides of the barrels, the stoops and the floor, are not suffered to remain wet with the beer spilled or running over Dirtiness and moisture are apt to make the beer smell in the barrel.

OF THE PROPORTIONS OF MALT AND OTHER INGREDIENTS.—The following are about the average proportions of malt, used in England: but the barley of America is not equally good, nor is the process of malting carried to such perfection: hence, the same quantity of ale or porter will require about one fourth more of malt to make a liquor in America of equal strength.

When nothing is used to make ale or porter, but malt and hops, it will require in England about three bushels of malt to make one barrel of ale of 32 gallons, or porter of 36 gallons. But this will be *strong*.

For *ale* intended to be drank immediately ¾ of a lb. of hops to the bushel, will suffice. If meant to be kept a twelvemonth, allow 1 lb. to the bushel: if longer 1¼ lb.

Porter requires 1⅓ lb of hops to the bushel, if no bitter but hops be used.

Small beer is usually brewed from the malt after the quantity of wort intended for ale is taken off: then a quarter (or 8 bushels) of malt, will make about one barrel of strong ale, and two barrels and a half of good small-beer: the hops used for the ale, kept in a net during boiling, will do with a little addition for the small-beer.

But small-beer so made, is never so good as when it is run off by itself from a quantity of malt wholly appropriated to it.

In this case about 1¼ or 1½ bushel of malt will make one barrel of good small-beer, with ¼ of a lb. of hops to the bushel.

But in all malt liquors, the addition of a small portion of sugar, gives more strength to the liquor, and enables it to keep better; particularly in summer time: hence the following proportions seem preferable in practice, for this country:

ALE.—Malt (amber) 3½ bushels: hops 3 lbs.; good moist sugar 1½ lb.; about ½ an ounce of coriander seeds will be an improvement. The addition of the sugar will nearly make up for the deficiency in strength of the American malt This will make one barrel of strong ale. For an account of *Mashing Machine*—see that article.]*

Having thus afforded an analytical view of this important subject, we shall conclude it with an account of the latest patents, which have been granted to those who have contributed, or attempted to improve the art of Brewing.

In March, 1788, Mr. W. KER, of Kerfield, Tweedale, received the king's patent for his improvement in brewing ale, beer, porter, and other malt liquors, so as to save a considerable portion of hops, to produce the liquors of a superior flavour and quality, and render them less liable to become acid or putrid. The steam which arises from the boiling copper, is known to be strongly impregnated with the essential

* The preceding paragraphs were furnished by Dr. COOPER, for the first American edition of this work.

oil of the hops, in which their flavour consists. Instead, therefore, of allowing it to escape and evaporate, as it does in the common mode of brewing, Mr. KER contrives to preserve and condense it, by means of a winding-pipe fixed to the copper, similar to the worm of a still, or by a straight pipe passing through cold water, or any other cooling medium The oil and water, thus obtained, are returned into the worts when boiled; or the oil, after being separated from the water, along with which it had been exhaled, is returned into the worts after they are boiled; and the watery part, which, after the oil is separated, still continues impregnated with the aromatic taste and bitter of the hop, is returned into the next copper or boiling vessels, and so on, from one copper or boiling vessel into another. By this process, a considerable part of the hop and flavour, which is lost in the ordinary mode of brewing, is preserved; the flavour of the liquor is improved by the preservation of the finer parts of the aromatic oil; and the ale and beer are better secured from any tendency to acidity or putrefaction, and therefore must be fitter for home consumption and exportation.

In June, 1790, Mr. JOHN LONG, of Ireland, obtained a patent for an improvement, which he calls *an entire new method*, in *all the essential parts*, of brewing good malt liquor. Though his method, in one respect, is similar to that adopted by Mr KER, yet as it comprehends the whole process of brewing, we shall lay it before our readers, nearly in the words of its author.

1. For the better extracting the virtues of malt, place near a mashtun a shallow copper, or other vessel, that will readily heat, the curb of which to be on a level with the tun, and to contain from two to six hogsheads, according to the dimension of the tun, more or less; and, at the lower end of the copper, have a cock, from two to five inches in diameter, to conduct the heated liquor from the copper into a tube, which passes down the external part of the tun, and enters it through an aperture about six inches from the bottom; then forming two revolutions, more or less, through the body of the tun, and communicating its heat to the wort as it passes through the tube, and then, at a convenient distance from the place where it first entered, it runs from the tun into a cistern or tub, situate as near as convenient to the copper or heating-vessel. In the tub or cistern is to be placed a pump, for the purpose of conveying the cooler liquor back to the copper or heating vessel again, there to receive the heat of 208 degrees, more or less (which it will require after the first half hour) and then convey it through the mashing tun, as before, and in the same manner, as long as the working brewer may think necessary, to raise the mashing-tun to any degree of heat required. By adhering to the foregoing process, the first liquor may with the greatest safety, be let upon the malt, from 20 to 30 degrees lower than the present practice; by which means it operates with gentleness, opens and expands the malt, and prepares it for the reception of sharper or warmer liquor, so as to extract the whole of the saccharine quality from the malt. By the foregoing method the mashing-tun, instead of losing its first heat (which it does by the present practice), continues to increase in heat every moment by conveying the heated liquor through the tube into the tun; by which means, at the end of two hours, the working brewer can have the tun brought to any degree of heat he shall think best suited to the different qualities of the malt. Persons who would wish to save expense, may heat their mashing-tun at the side or bottom, by a large piece of metallic substance made fire proof, and fixed therein: which, in some degree, will answer the end proposed, but with great trouble and delay

2. To prevent the wort from receiving a disagreeable flavour, while in the under-back, a tube must be placed at the cock of the mashing-tun, to receive the wort as it comes off, and convey it to a great cistern, or refrigeratory, which is supplied with a stream of water. The wort, passing through that medium in a spiral tube, soon loses that heat which so often proves prejudicial to the brewer in warm weather; it is then poured from the tube into a vessel in which pumps ars placed, to return the worts into the copper, for the purpose of boiling off

3. As the great object of long boiling the wort is remedied, by this invention of taking the extract from the hops in a separate manner from the worts, Mr. LONG boils the latter no longer than from fifteen to twenty minutes; and, by pursuing that method, he saves much time and fuel, and regulates the length of time accordingly.

4. He steeps his hops, the preceding day to which they are to be used, in a copper or other vessel, with as much fluid, blood-warm, as will cover the hops; where it is to remain over a slow fire, at least fourteen hours, close covered; the copper, at the tenth hour, not to be of a greater heat than 175 degrees, continuing slow until the last hour. Then he brings the copper gradually to a simmer, or slow boil; in which state he suffers it to remain about ten minutes and then runs off the fluid; and this he does at the same time the first wort is boiled off, that they may both pass together through the refrigeratory, into the fermentation or working-tun. After the foregoing operation, he covers the hops again with other liquor, brings the copper to boil as soon as convenient, and lets it remain in that state a considerable time, until the second worts are boiled off Then he passes the hop-fluid with the wort, the same as in the first instance; and, if there is a third wort, he boils the hops a third time with small worts, and drains off the liquid as before; by which means he gradually obtains the whole of the essential oil and pleasant bitter from the hops, which is effectually preserved in the beer.

5. When the wort is boiled off, it is conducted from the cock of the copper or boiler into a tube of a proper dimension, which passes the wort from the cock to the large cistern or refrigeratory, and there performs several revolutions, in a spiral manner, through the same tube; which is immersed in a constant supply of cold water, where it loses the greatest part of its heat in a short time, and thence continues a straight course through the tube, a little elevated, and of a suitable length, placed in brick-work, until it meets a small refrigeratory, supplied with colder water from a reservoir made for that purpose, at the head of the works, whence a continual stream runs on the surface of the tube down to the great refrigeratory, cooling the wort as it passes, in order to enable the working brewer to send it into the backs, or working-tuns, at whatever degree of heat he may think proper. The tubes may be made of lead or any other metallic substance.

6 To enable him to brew in the warm summer months, Mr Long sinks the backs, or working-tuns, at least to a level with the ground, but if deeper the better, and covers them closely by an arch made of bricks, or other materials, that will totally exclude the atmospheric air. He then places them as near as possible to a spring or sand-drain, as their depth will naturally draw the water thence, which must be so contrived as to pass or flow round the backs or tuns. Next he introduces a large tube which passes through the tuns, and keeps the wort several degrees lower than can possibly be done by the present practice; by which means he produces a complete fermentation, even in the dog-days.

7. In cold or frosty weather, if the tun and backs should lose the first heat intended to be conducted through the process by the foregoing method, a supply of warm or boiling water may be conveyed by the tube, which passes through the body of the backs or tun, communicating its heat, which rises to any degree the working brewer shall think proper: by pursuing this method in the coldest season, a fermentation may always be procured.

The following is a good recipe for brewing beer on a small scale. We can from our own experience testify to its value The quantity of malt is one peck only. In a copper, &c. that will hold ten or twelve gallons, boil your water, and when so far cooled down that you can see your face in it, put some of the water into a mashing tub, and add the malt by degrees, in order that it may be well mixed with a ladle, then add more malt and water, till the malt and about two or three gallons of water are used. Let it stand closely covered up with a woollen cover of two or three doubles about an hour, draw it off and pour on more boiling water. Let it stand half an hour, and repeat the process till you have the quantity of wort you wish to make. A peck of malt will make five gallons of decent table ale. After the wort has run off from the mash-tub, boil it quickly with about three ounces of hops. Then pour the liquor through a sieve into vessels to cool, and when about as warm as new milk fresh drawn from the cow, add about half a pint of yeast to it, which must be mixed thoroughly with the wort. When the fermentation is over, put it into a barrel; and after a day or two let it be closely bunged down: it will be fit for use in a month.

[One great principle in brewing, is to expose the malt to a degree of heat not beyond 175° of Fahrenheit, before it is exposed to a boiling heat; otherwise, the malt sets, becomes hardened, coagulated and insoluble. Some person at

Oxford, a few years ago, took out a patent for brewing, by which this inconvenience was obviated. It is best calculated for brewing on a small scale. Put the malt into the required quantity of cold water: heat the mixture gradually, so as to be an hour before you raise the temperature to 170°. Keep it at that temperature another hour; then bring it gradually to a boiling heat, and keep it at that heat till all the goodness of the malt be extracted: this may be in 3 hours more. Draw off the liquor into a shallow vessel as a cooler; and ferment at the usual temperature.

Let it be remembered, that to make *good* beer nothing is necessary but malt and hops; and to make *wholesome* beer, no other materials ought to be used. All the liquors called imperial, and treacle or molasses beer, are very poor substitutes for malt liquor.—T. C.]

Those of our readers who are desirous of farther information on the subject, may consult the last edition of "*Philosophical Principles of Brewing*," by Mr. RICHARDSON, of Hull, England; a work of acknowledged merit, and practical utility.

BRIAR, the Sweet, or *Rosa rubiginosa*, L. by HUDSON and DUROI, called *Rosa eglantaria*, is a well known indigenous plant, found in hedges and on heaths. It grows to the height of five or six feet, having green branches armed with prickles. See WITHERING, 466. The varieties of this species are the common single-flowered, semi-double-flowered, double-flowered, blush double-flowered, and yellow-flowered. This shrub deserves to be cultivated, on account of the odoriferous property of its leaves. The best places for planting it, are the borders contiguous to walks, where it will profusely emit its refreshing fragrance. The young branches of the sweet-briar are a rich addition to the odour of nosegays and bough-pots. The blossoms of this shrub are constantly visited by bees, and the leaves are used in Europe in tanning soft leather.

Wild Briar or *Hep-Tree*. See the more general name of DOG-ROSE.

BRICK, a mass of clay formed into oblong squares, and dried in the open air, or burnt in proper kilns, to serve the various purposes of building.

Bricks ought, when burnt, to be nine inches long, four and a quarter broad, and two and a half thick: they are commonly used for paving cellars, sewers, sinks, hearths, &c. There is, however, a great variety of bricks, in consequence of their different forms, dimensions, uses, and the method of making them.

In England, they are chiefly made of a motley, yellowish, or somewhat reddish, fat earth, vulgarly called *loam*. Those of Stourbridge clay, and Windsor-loam, are esteemed the most proper and durable bricks; such as will stand the greatest degree of heat, without melting. In general, the earth for this manufacture ought to be sufficiently fine, free from pebbles, and not too sandy, which would render the bricks heavy and brittle; nor too fat, which would make them crack in drying. Nor should it contain too many calcareous and ferruginous ingredients; as the former prevent the mass from becoming firm in burning, and occasion the bricks to crumble, when exposed to the air; while the latter, or iron particles, retard the preparation of bricks, insomuch that it is sometimes impossible to give them due consistence: this inconvenience, however, may be remedied, by allowing the clay to lie for a considerable time under the influence of the atmosphere, then soaking it in pits, and afterwards working it well in the usual manner. The common potter's clay, which is also employed for the manufacture of bricks, is opaque, imparts a slight colour, sometimes yellowish, blueish, greenish, but more frequently of different shades of light grey, excepting that of blue, which is always dark: by kneading and spreading such clay, it becomes smooth and glossy; it is soft, fat, and cold, though agreeable to the touch, slightly adheres to the tongue, and, when of the best quality, it should neither be too light nor too heavy. Its constituents, chemically examined, are found to consist of *thirty-seven* parts of pure argillaceous or clayey earth, and *sixty-three* parts of siliceous or flinty earth.

Whoever is desirous of producing the best and most durable kind of bricks, ought to attend to the following rules: 1. Clay of every description, whether fat or lean, whether more or less mixed with particles of lime, iron, &c. must be dug up after Midsummer, that is, between the beginning of July and latter end of October, before the frost first appears: it should be repeatedly worked with the spade, during the winter, and not formed into bricks till the following spring. 2. The clay, before it is put into pits for soaking, must be broken as small as possible, and allowed to lie at least ten days: every

stratum of twelve inches should be covered with water, as in this manner it will be more uniformly softened 3. Two such pits, at least, will be necessary for every brick-manufactory, so that after having been suffered to remain for five days, the second may be prepared, and thus the manufacture carried on without interruption. 4. The next step is that of treading and tempering the clay, which requires double the labour to what is usually bestowed on it; as the quality of the bricks chiefly depends upon the first preparation. If, in tempering them, too much water be used, they become dry and brittle; but, if duly tempered, they will be smooth, solid, and durable. Such a brick requires nearly as much earth as one and a half made in the common way, when too great a proportion of water is added; in which case the bricks become spongy, light, and full of flaws, partly through neglect in working them properly, and partly by a mixture of ashes and light sandy earth (as is generally practised in the vicinity of London,) with a view to despatch and facilitate the work, as well as to save culm or coals in the burning. 5. Bricks made of proper earth being more solid and ponderous, require a much longer time for drying than those made in the common way; they ought not to be removed to the kiln, till they have become lighter by one half, and give a hollow sound on collision; because the proper drying of bricks will prevent them from cracking and crumbling in the kiln. 6. Of whatever materials the kiln be constructed, each burning of from 6 to 10,000 bricks, requires that the fire be kept up for 24 hours, and double that time for a number of from 12 to 50,000. The uniform increase of heat deserves great attention; the duration of it should be regulated according to the seasons; and during the last 24 hours, the fire should be uninterruptedly supported by means of flues; but afterwards the kiln must not be suddenly closed, as there is always some danger either of bursting the flues, or more probably of melting the bricks.

It would be useless here to enter into particulars relative to the manner of burning bricks in the neighbourhood of London; we shall therefore only observe, that they are chiefly burnt in *clamps* built of the bricks themselves, after the manner of arches, in kilns, with a vacancy between each brick to admit the passage of the fire, but with this difference, that instead of being arched, the bricks project one over another on both sides of the space for laying in the wood and coals, till they meet, and are bounded by the bricks at the top. The place for the fuel is carried up straight on both sides, till about three feet high, when it is almost filled with wood, over which is laid a stratum of sea coal, and then the arch is spanned over Farther, sea-coal is also strewed over the clamp, between all the rows of bricks; and lastly, the wood is kindled, which also communicates with the coals; and when the whole is consumed, the manufacturer concludes that the bricks are sufficiently burnt.

Fire bricks are made in Philadelphia of certain proportions of clay from the banks of the Delaware, a few miles below Bordenton, and the sand found near the lower bridge on the Schuylkill.

[The earth should be thrown up in ridges in August, and be permitted to remain exposed to the frosts of winter till spring It should then be well kneaded and mixed. It is mixed in London with the sifted ashes of coal fires in alternate layers, one inch of ashes to six inches of brick earth. It is then again mixed and kneaded. An acre of brick earth one foot deep, will furnish one million of bricks One man can mould 5000 bricks from 5 in the morning to 8 at night. He requires a gang of six persons to supply him, of which three may be boys. In London they *skintle* the bricks after moulding for about 4 days: that is they set them cross-wise \/\/ to admit a current of air through them to dry them Then they burn them, with coals, putting a layer of breeze or coal cinders between each layer of bricks and also on top of the kiln. In America no bricks are well burnt. A brick will be worth twice the money, if burnt over again: they will be safer and stronger. All bricks for outside work should be twice burnt. Bricks are better burnt in kilns than in clamps. An ill-burnt brick is perpetually swelling and shrinking, from giving out moisture and absorbing moisture. A house built with such bricks, can never be dry or wholesome.

In London a tile weighs 37 oz : 700 of them cover 100 square feet; or 2½ ton weight to 42 square yards The same surface may be covered with 26 cwt. of fine slate, with 36 cwt. of coarse slate, with 27 cwt. of lead, and with 4 cwt. of copper. In England a most

useful kind of brick is made, by casting it in a mould the slag of the copper and iron furnaces while in fusion.—T. C.]

Oil of Bricks, a singular preparation, formerly much esteemed in the cure of many diseases; but now justly exploded as absurd and pernicious rather than useful. It is obtained by soaking fragments of bricks in olive oil, and afterwards distilling them in the usual manner. In the present improved state of chemistry, it has been found that, by this fanciful process, the oil of olives, so far from being impregnated with healing ingredients, is necessarily corrupted.

BRIDGE, a construction of stone, timber, or iron, consisting of an arch or arches, and built over a river, canal, &c. for the convenience of passengers.

The longest bridge in England is that over the Trent at Burton, being 1545 feet in length, and consisting of 34 arches. This was built in the 12th century. The triangular bridge at Croyland, in Lincolnshire, which was erected in the 9th century, is said to be the most ancient Gothic structure remaining in the kingdom. London-bridge is 900 feet long, 60 high, and 74 wide: it is supported by 18 piers from 34 to 25 feet thick. Westminster bridge is 1223 feet long and 44 feet wide. It was finished in 1750, and cost 389,000*l*. Blackfriars-bridge was finished in 1770: it consists of nine large arches, nearly elliptical; the breadth of the bridge is 42 feet, and the length, from wharf to wharf, 995 feet. It cost 150,840*l*. [The Waterloo Bridge, built in 1817, contains within the abutments, 1242 feet; total length, 2890; span of each arch, 120; thickness of each pier, 20.—T. C.]

The width of small bridges is generally thirty feet, but those near large towns usually have thirty feet clear carriage way, besides the foot path: the parapet walls on each side are about 18 inches thick, and four feet high; they commonly project with a cornice underneath; sometimes balustrades of stone or iron are placed upon the parapet, as at Westminster bridge; but this method is only employed where a bridge of great extent is constructed near a capital.

Where stone bridges cannot be erected on account of the expense, very strong and durable bridges may be constructed of wood: these ought to so framed, that all the parts may press upon each other like an arch: and thus, instead of being weakened by the pressure of a heavy body in its passage over it they will become stronger. The method of forming a wooden bridge is so well known to every architect, that it is needless to enlarge upon the subject.

Among the Romans, the building and repairing of bridges was committed to the *pontifices*, or priests; and the care of these edifices was afterwards undertaken by the Emperors themselves. In the middle ages, the constructing of bridges was classed among the acts of religion, and a regular order of hospitallers was founded by St. BENEZET, towards the end of the twelfth century, who were denominated *pontifices*, or bridge-builders; their office was to facilitate the progress of travellers, by making bridges, establishing ferries, and receiving strangers into hospitals, or houses, on the banks of rivers.

Of all the bridges of antiquity, that built by TRAJAN over the Danube is allowed to be the most magnificent: the piers were 20 in number, built of square stone, and each 150 feet above the foundation, 60 feet in breadth, and 170 feet distant from each other. The piers of this vast structure still remain. Among modern bridges, that built over the Thames at Westminster, may be considered as one of the most magnificent in the world; it consists of 13 large, and two small arches, together with 14 intermediate piers: the two middle piers are each 17 feet in thickness at the commencement of the arches, and contain 3000 cubic feet, or near 200 tons of solid stone: the middle arch is 76 feet wide.

A patent was granted to Mr NASH, of Dover-street, London, in 1797 for an important invention in the construction of bridges. He provides hollow masses of cast or wrought iron, which are to be filled with earth, sand, &c. and have the appearance of solid bodies. According to this plan, the arch of the bridge is formed by hollow frames, or boxes, each consisting of four sides and a bottom. These boxes, after being properly arranged in the manner stated by the patentee, are then to be filled with sand, stones, &c. by which means the arch becomes like one solid body cased with iron. An explanation of this invention may be be seen in the sixth volume of the *Repertory of Arts and Manufactures*.

The latest patent for bridges, was that granted in June 1800, to Mr. SA-

muel Wyatt, of Chelsea College, for his invention of a new method of constructing bridges, ware-houses, &c. without the use of wood, as a constituent part. The principle of his discovery consists in the combination of pipes, tubes, or hollow pieces of cast iron, in a longitudinal direction, and plates or pieces of the same material, having sockets in them to receive the ends or shoulders of the pipes, placed transversely, and extending from one side of the bridge to the other, so that when the requisite number of pipes, &c are put together, they form an arch so firmly, as not to require the aid of screws, bolts, cramps, or any iron fastening whatever; but the joints should be closed with lead or cement.

When applied to ware-houses and other buildings, Mr. Wyatt's invention consists in forming arched ceilings of cast iron, and supporting them and the floors by hollow pillars, or cylinders, of the same material It ought to be remarked, that the number of sockets in the transverse iron plates, should always correspond with the number of ribs in the arch.

Various other kinds of bri[illegible] constructed, according to the [illegible] to which they are designed, [illegible] pendant or hanging-brid[illegible] bridges, floating-bridges, made of copper, or wooden-[illegible] tened with stakes or anchors, and covered with planks: but as the description of them would swell this article to an undue length, and as they are not immediately connected with subjects of economy, we shall content ourselves with having given the preceding account of bridges in general.

The bridge which Judge Finley (near Union-town) had undertaken to erect across Jacob's Creek, at the joint expense of Fayette and Westmoreland counties, Pennsylvania, near Judge Meason's, on the great road leading from Union-town to Greensburgh, is now completed. Its construction is on principles entirely new, and was perhaps the first of the kind in the world. It is solely supported by two iron chains, extended over 4 piers, 14 feet higher than the bridge, fastened in the ground at the ends, describing a curve line, touching the level of the bridge in the centre. The first tier of joists are hung to the chains, by iron pendants or stirrups of different lengths, so as to form a level of the whole The bridge is of 70 feet span, and 13 feet wide; the chains are of an inch square bar, in links from five to ten [illegible] long, but so that there is a joint, [illegible] pendant must bear

The projector has made ma[illegible] experiments, to ascertain the real strength of iron, and asserts, that an inch square bar of tolerable iron, in this position will bear between thirty and forty tons, and of course, less than one eighth part of the iron employed in the bridge, would be sufficient to bear the nett weight thereof, being about twelve or thirteen tons.

Mr Findley, embarked in this business at his own risk, and engaged that the work should endure at least fifty years (except what should be necessary for repairs of flooring) for the moderate sum of six hundred dollars He further observes, that a bridge of the same width and 280 feet span, would be about 50 tons weight, the chains double as strong as the foregoing, the whole of the iron required, would then amount to six tons, and say the smith-work to half its value. The piers 46 feet 8 inches high. These chains, so placed, would support 240 tons, deduct its own weight of timber, and so much of the iron as falls between the piers, say 53 tons, remainder 237 tons

BRINE, or Pickle, is water saturated with saline particles It is either native, as the sea-water, or factitious, when formed by a solution of salt in water

Pickle made according to the common rule, *that it should bear an egg*, may be sufficiently strong to preserve substances intended for early use. A true pickle, however, for preserving meat, fish, and butter, during a long voyage, ought to be boiled down till the salt begins to crystallise, which is discoverable by a thin scum on the surface of the liquid while it continues over the fire. The water being then completely saturated with salt, the pickle is perfect.

[It is certainly very unscientific to neglect the use of salt-petre, whose antiseptic powers are so much stronger than those of salt, One gallon of water will take up 33½ oz. of salt, but 24 oz of salt with 2 oz. salt petre, will be a stronger pickle. In general, where meat is not intended for long voyages, the best proportions are 20 oz. salt and 1½ oz. salt petre with 1 lb. molasses to a gallon of water. Boil for ten minutes, scum, and when cool pour it on the meet —T. C.]

Brine springs, those saline fountains which yield water for the manufacture of salt. It is supposed that the saline

springs at Namptwich, in Cheshire, would be sufficient to yield salt for the consumption of all England.

Besides this, there are several other remarkable brine-springs in England, particularly that of East-Chennock, in Somersetshire, which rises twenty miles from the sea; and another at Barrowdale, near Keswick, in Cumberland. The latter rises in a plain near a bog, and sixteen gallons of the water yield one of pure salt, which is the more remarkable, as an equal quantity cannot be obtained from less than twenty-two gallons of the waters of the German ocean.

There are several other salt-springs beside those above mentioned, particularly at a place in Durham, called *Salt-water Haugh*, where a multitude of saline springs rise in the River Wear, to the extent of about forty yards in length, and ten in breadth. One of these, which issues from a rock, is so strong, that in the space of a hot summer's day, the surface is covered with pure crystallised salt. In these springs the water is strongest at the bottom, and richer in dry than in wet weather. They generally yield four ounces of salt to a pound of brine. It is probable that there is an immense mass of fossil salt in the bowels of the earth in the counties where these springs arise. There are several other substances dissolved in this water beside salt, particularly sulphureous matter, an impure ochre which discolours the brine, but speedily subsides: and in most, a selenitic earth is found deposited at the bottom of the salt-pans.

[Rock salt is usually accompanied by gypsum among the strata deposited at the same time with the salt; the principal body of rock salt is usually above the old red sand stone, sometimes immediately—sometimes there are intermediate strata. In England it is in the red marl; concerning which there is some doubt as yet (1818) whether it be or be not a member of the old red sand stone of Werner. It is lower than the secondary coal formation. In North America, no beds of salt have yet been reached, though plains and hills covered with salt are found upon the Arkansas, and its northern branches and streams. The Red river also contains much salt.

Take ARROWSMITH's map of the United States. Stretch a string from Salina in the Genesee country to the salt lakes just below the 33d. degree of latitude west of the Mississippi, and it will cut most of the salt works of the United States. This was first remarked to me by my friend Mr. WARREN. Salt licks and springs are found in Pennsylvania, near the second fork of Lycoming Creek, and on Sinnamahoning; hence the salt formation is probably at least as wide as from thence to the salt of the Genesee in a north and south line. It subtends most of the state of Kentucky, and how far to the north of it is unknown. Hitherto salt springs only are worked among us; the body of salt will probably be penetrated hereafter. If large-grained salt be wanted, the evaporation in the salt pans must be conducted by a very gentle heat, and very slowly. If the evaporation be hastened, the grain will be small, and the salt light.—T. C.]

Brining of Corn.—See SMUT.

[BRITISH OIL, is a mineral bitumenous oil, procured by distilling the sand stone over the coals at Pitchford in Shropshire: used for sprains and rheumatisms. It is in fact the oil of mineral coal.—T. C.]

BROAD-CAST, a term in husbandry, used to denote a particular mode of sowing corn, pulse, turnips, clover, grasses, and most field plants. When seeds are scattered over the surface of the ground by the hand, they are said to be sown in broad-cast, by which this method is distinguished from drilling, and horse-hoeing, or the new husbandry.

The comparative merit of the drill and broad-cast has, by several experiments, been determined in favour of the former. One of the most practical details on this subject was communicated to the *Society for the Encouragement of Arts, Manufactures, and Commerce*, by Mr. BOOTE, of Atherstone, who, in the year 1789, obtained the gold medal from that patriotic institution, as an acknowledgment of his merit, in ascertaining this interesting point.

Mr. BOOTE selected a piece of cold clay land of twenty acres, four of which were drilled with four bushels of wheat, and, at the same time, four acres adjoining, of a similar soil, were sown in the broad-cast way, with ten bushels of the same grain.

In the beginning of April 1788, the drilled wheat was first hoed, and again in the last week of the same month, when the broad-cast was also hoed, with hoes of a proper size for the purpose.

At harvest, the crops were separately reaped and threshed to ascertain the difference of each produce. That of

the four acres drilled was one hundred and nineteen bushels, one gallon, and four pints; and the four acres broad-cast yielded ninety-four bushels, two gallons, and four pints. Hence the difference in favour of the former was twenty-four bushels, seven gallons, valued at five shillings and six pence a bushel, together with six bushels of seed saved by drilling, which cost seven shillings and four pence half-penny a bushel, amounting in the whole to nine pounds, one shilling, and three farthings.

In this comparative experiment, a bushel of wheat produced by the broad-cast was nearly equal in weight to a bushel of that obtained from the drill. Mr. GREENWAY, however, by an experiment made in the year 1787, found that the grain of his drilled crop was superior to that of his broad-cast, not only in quantity but in quality, the former weighing two pounds per bushel more than the latter. But as his broad-cast crop was not hoed, it may be fairly inferred, that it did not arrive at full maturity, either in consequence of the injury done to it by weeds, or for want of the soil being pulverised by the hoe.

The superiority of the drill method, in the culture of turnips, was ascertained by Mr. DANN, of Gillingham, and the silver medal of the society adjudged to him for his successful experiment.

On the 6th of July, 1789, he drilled four acres of turnips, and, on the same day, in the same field, he sowed two acres broad-cast. A very considerable difference appeared in favour of the drilled plants from their first coming up, in consequence of which he sowed no more by broad-cast. The drilled turnips were ready for hoeing five or six days before those that were sown broad-cast on the same day. Besides drilled turnips being less liable to injury from frost, and less difficult to hoe, than those sown broad-cast, about three-fifths of the seed used in the latter method are sufficient for the ground when drilled. When the turnips were come to maturity, Mr. DANN selected two perches from each of those cultivated according to the different methods before mentioned, and found that the two perches drilled, produced 494 lbs. and those broad-cast only 446 lbs. making a difference of 48 lbs. in favour of the former method.

It must be evident to the agriculturist, that seed deposited from one and a half to three inches deep in the soil will vegetate sooner, and grow faster, than that sown on the surface, which is seldom buried deeper than from one-quarter of an inch to an inch, at a season when moisture is particularly requisite for the growth of the plant.

BROCCOLI, a species of the *Brassica*, or Cabbage-plant, cultivated for the use of the table. There are several kinds of this plant, particularly the purple, the white, and the black broccoli, &c. but the Roman, or purple species, is preferable to all others. The seeds of this vegetable should be sown about the latter end of May, or beginning of June, and when the young plants have germinated eight leaves, they should be transplanted into beds. By this management, towards the latter end of July they will be fit to be planted out in some well sheltered piece of ground, at the distance of a foot and a half in the rows, and two feet between each row.

The soil proper for broccoli is rather light than heavy. The brown or black species, though inferior to the Roman, is much hardier. It should be sown in the middle of May, and planted about two feet and a half asunder. Naples broccoli has a white head similar to the cauliflower, and is scarcely distinguishable from it in flavour.

According to Dr. DARWIN, the cultivation of broccoli and cauliflower must be very similar, except as to the seasons of the year; for they are varieties of the same species. The following directions for the culture of this plant were transmitted to the Doctor by Mr. TIGHE, of Ireland; which for their practical utility, we shall lay before our readers.

Broccoli may be so managed, as to supply the table with a delicious and salutary vegetable during seven months of the year, namely, from the beginning of November till the end of May. For this purpose, procure prime seed from Rome or Naples, both for early and late sowing. Sow at the cessation of the vernal snows, and repeat it once a month till the end of May or longer. When three leaves appear, transplant them; and when six leaves appear, transplant them a second time. Afterwards in June, July and August, transplant them again two or three feet asunder, and let them remain. During September and October, the ground must be loosened, repeatedly cleared from weeds and stones, and the plants earthed up, to preserve their roots from the frost, and to prevent their being injured by the equinoxial winds

Sprinkle the mould about them occasionally with water impregnated with dung. Care should be taken to sow and plant them at a distance from hedges, trees, and walls

The head of the broccoli is generally completed in five or six days from its first appearance, and should not be suffered to remain much longer; the stalk may be boiled with the flower, but should be peeled before it is brought to the table.

Some kinds of Italian broccoli are said to produce bulbs at their roots, which are supposed to be for the purpose of supporting other stems. If such stalks appear, they should be broken off when the principal stem is transplanted.

In order to obtain good seed of the Naples broccoli, a few of the largest heads of the earliest growth must be reserved to run up to seed. All the under shoots should be taken off from time to time as they sprout, leaving only the principal stem to produce flowers and seed. By this management, if no other species of cabbage be permitted to seed near the broccoli, its seeds will be as good as those imported, and the propagation of the plant may thus be continued for many years.

BRONZE, a metallic compound of copper and tin, to which zinc and other substances are sometimes added. It is hard, brittle, sonorous and specifically heavier than the metals of which it is composed.

The relative quantities of the component metals are varied according to the use to which the bronze is to be applied. Tin being less subject to rust than copper, renders bronze capable of being exposed to the air without becoming covered with verdigris, which is one reason why it is used for such works as cannon and statues. The greater susceptibility of bronze than copper, is also an advantageous property, and much facilitates the casting of large works It appears that tin, on its mixture with copper, changes the size and disposition of its pores, and gives to the compound a compactness through which it becomes specifically heavier than either of the metals in a separate state, and more secure from the corrosion of the atmosphere.

[Bronze is usually applied to mixtures of copper and tin, and sometimes zinc: of which most of the ancient arms were made Speculum metal is a kind of bronze, of three parts copper, one part tin, silver, one-fourth of a part, arsenic, one-sixteenth of a part. —T. C.]

Bronze-colour, in imitation of the metal, is much used by the colourmen of Paris, who prepare two sorts of it, namely, the red bronze, and the yellow or golden: the latter is made solely of the very finest and brightest copper-dust; the former is prepared of the same material, by adding a small proportion of well-pulverised red ochre. Both are applied, with varnishes, to the outside of substances, as gold leaves are in gilding. But, to prevent it from turning green, the bronzed work should, as soon as laid on, be carefully dried over a chafing-dish.

BROOK, a little river, or small current of water. It is distinguished from a river by this circumstance, that in general it has a current only at particular seasons, whereas a river flows throughout the year.

Considerable damage is sometimes occasioned by the overflow of brooks, in consequence of sudden and heavy falls of rain. An inundation is caused by a stoppage of the water in its course, which prevents it from running off as fast as it comes in; consequently, if the channel for the efflux be larger than that for the influx, the water will not overflow the banks. Thus, by opening the channel of the river Welland, at Harborough, in Leicestershire, England, to a considerable distance below the bridge, the river has never since overflowed the town, as it formerly did after sudden rain.

The legislature has enforced the clearing of the channels of brooks near turnpike-roads, by enacting, that the commissioners shall give notice in writing, to the overseers of the highways, of the several parishes through which such brooks or rivers flow, to open their respective channels, that the water may have free passage.

BROOM, the Common, or *Spartium scoparium*, L. an indigenous plant, very common on sandy pastures and heaths, and requiring no particular description. When growing of a large size, the broom deserves a place among our flowering shrubs, on account of the profusion of its gold-coloured blossoms. Its use is very extensive, not only in domestic economy, but likewise in the arts, and in medicine. Although this vegetable is chiefly employed for making brooms, thatching houses, and covering stacks in preference to straw, as it more readily admits the air into the stack, and equally

well secures it from rain; yet it also serves as a substitute for the oak bark, in the tanning of leather; for which purpose both the twigs and branches are usefully employed. The old wood of the common broom furnishes the cabinet-maker with most beautiful materials for veneering.

Broom, the Spanish, or *Spartium junceum*, L. an exotic shrub, which may be easily cultivated in our climate, by sowing it either in the spring or autumn: but as the plants will not succeed when removed after attaining a large size, they should be transplanted before they are two years old. The twigs are employed for basket-work, and the flowers afford a plentiful supply of food for bees: hence the culture of this shrub is recommended near bee-hives.

BRUISES, or contusions, being frequently neglected at first, may produce consequences more alarming than those of wounds. Blows received on the head, pit of the stomach, hip, or the knee, are the most dangerous. A violent inflammation, in consequence of injured nerves, or the destruction of blood vessels, often occasions the mortification of those parts, which the most skilful treatment cannot retrieve, if the accident be neglected for many hours or days. Instead, therefore, of listening to officious old women, or neighbours, an experienced surgeon ought instantly to be consulted. We know a recent melancholy instance, of a most promising youth, who, when studying physic at Edinburgh, was so improvident as to suffer a slight contusion on the knee to pass unnoticed; which, however, proved fatal to him a week after the accident.

When the contusion is slight, fomentations with lukewarm vinegar and water, in which 1 oz. of sal ammoniac is dissolved in a pint, repeatedly applied to the part, will generally relieve it.

Bruises, if neglected, even in temperate climates, are often attended with painful effects; but they frequently prove fatal in hot countries. With a view to prevent inflammation, Dr. Dancer advises speedily to apply embrocations, consisting of opodeldoc; of camphor and strong rum: or of both the last mentioned articles with a little soap; to which a small quantity of laudanum may be added. Should the inflammatory symptoms increase, he directs the following saturnine solution to be employed: Let two drachms of sugar of lead, be combined with 16 oz. of water, 4 oz. of vinegar, and two teaspoonfuls of laudanum. Lastly, to remove the debility which usually remains after contusions, or sprains of the joints, he recommends the affusion of cold water, or stimulating frictions, and electricity.

BRUSH, a domestic implement, consisting generally of a collection of hairs or bristles, fastened in a frame of wood, bone or ivory; with, or without a handle; and used for various purposes. This simple manufacture is capable of great improvement; as we seldom meet with brushes, the hair of which is so firmly cemented, or otherwise secured in the frame, as to ensure their constant use, until the hair itself is worn out by mechanical friction. We shall, under the head of Cement, communicate a few hints for remedying this defect.

Flesh Brush, an instrument frequently employed for increasing the circulation of the fluids in languid habits, especially in paralytic and rheumatic cases, in order to relieve pain and uneasiness of the skin. Although we do not deprecate, but rather strongly recommend, friction to the aged and sedentary in particular, yet we are of opinion that this simple and useful operation may be performed with equal ease, and more attention to cleanliness, by a piece of flannel, than by a flesh-brush; because the perspirable matter adhering to each hair of the latter, is thus spread from one part of the body to another: whereas the former may be frequently turned, and afterwards washed, as often as is necessary.

BRUTE, a general name for all animals, except mankind. They form the second order of animals in the class Mammalia, according to the Linnæan system. The animals of this order are characterised as having no fore teeth in either jaw: feet with strong hoof-like nails; slow motions, and as feeding chiefly on vegetables. There are nine genera as the Sloth, Elephant, &c. Investigations relative to the structure and economy of brutes, form the subject of what is called *Comparative Anatomy*.

[Brutes have inferior organisation, and therefore inferior capacity to man. Their brains are smaller; they have not the faculty of speech, they have no hands. Hence having the organs and instruments of acquiring and communicating knowledge so imperfect comparatively, they must of course be inferior animals. The want of organs of

speech, and the want of hands, forbid any mutual communication of acquired knowledge. They are incapable of speech, of reading, and of writing: they can have no repositories of accumulated knowledge.

Brutes manufacture no instruments to aid their bodily exertions—they know not the use of fire—they do not cook their food. But they reason; they observe facts, and draw conclusions. A dog has lost his master: he comes to a cross road, and chooses by his nose the road which he conjectures his master has gone. He says to himself, he has not gone this way, or that way, for I cannot observe his scent: but here I have it; he has gone this way. How often do dogs trace their master to houses he is accustomed to frequent! The instances of reasoning are too numerous and too obvious to doubt or to dwell upon them.

In England and in Pennsylvania, wanton cruelty to animals is, as it ought to be, an indictable offence. Lord ERSKINE's speech on the subject, is an admirable specimen of eloquence dictated by humanity.—T. C.]

That brutes are capable of reflection and sentiment, and are susceptible of the kindly as well as the irascible passions, independently of sexual attachment and natural affection, is evident, from the various instances of regard and gratitude daily observable in different animals, particularly the dog: of these and other sentiments, such as pride and glory, many surprising and indubitable proofs are exhibited by the ELEPHANT, of which we shall give some account in its proper place.

BRYONY, the WHITE, or more properly, the RED-BERRIED BRYONY, or Wild-vine; the *Bryonia alba* or *dioica*, L. The root is perennial, large, often a foot in circumference; the stem is several yards in length; the leaves nearly hand-shaped; the flowers of a yellowish green colour, appearing in May and June; and the fruit is a smooth red berry, containing five or six seeds. Some curious persons have a method of carving these roots into human figures, and selling them as mandrakes; but this useful production may be converted to much better purposes.

Bryony-root is purgative and acrid: its smell, when fresh, is strong and disagreeable: its taste nauseously bitter. In spring, it abounds with a thin, milky juice, which is so sharp as speedily to excoriate the skin; but a great part of the acrimony, and almost the whole of the scent, is lost by drying. In summer, the root is less juicy, and weaker both in smell and taste. An extract prepared in water, acts more mildly, and with greater safety, than the root in substance. When given in a quantity from half a drachm to a drachm, or half an ounce of it infused in wine, it proves a gentle purgative, and likewise operates powerfully by urine. Hence small doses of its milky juice have been strongly recommended by BERGIUS, for dropsical and asthmatic complaints. A cold infusion of the root, in water, is externally used in rheumatic pains, or the *sciatica*. In the form of a cataplasm, it proves a most powerful discutient. Decoctions made with one pound of the fresh root, are the best purgatives for horned cattle. In short, observes Dr. WITHERING, the active virtues of this plant entitle it to more attention than is bestowed on it at present.

[Dr. WANT says, that 4 oz. of the roots of bryony cut fine, and digested in 8 oz of white wine for a day or two, gives an infusion amounting to two doses of a very efficacious remedy in gout, rheumatism and dropsy.—T. C.]

BRYONY, the *Black*; or the Bryony lady-seal, the *Tamus communis*, L. It has a large root, sending forth several stems, large heart-shaped, dark green leaves; greenish flowers, and red berries. It blows from May to August, and is frequently found under hedges. According to Dr. WITHERING, its young shoots are good eating, when dressed like asparagus; but horses refuse to eat the plant. Its root is like that of the white bryony, acrid and stimulating.

The several exotic species of the bryony, as the *Africana*, the *racemosa*, with a red olive-shaped fruit, the *Cretica*, or spotted bryony of Crete, the *variegata*, or American bryony, merit cultivation, on account of their beautiful appearance, when full of fruit.

BUBBLES, are small drops of fluids filled with air. The little bubbles, rising up from fluids, or hanging on their surface form the white scum at top, and these same bubbles form the steam or vapour flowing off from liquors in their boiling state.

BUCCANEER, one who dries and smokes flesh or fish after the manner of the Indians. The name was particularly given to the first French settlers on the island of St. Domingo, whose sole employment consisted in hunting bulls or wild boars, in order

to sell their hides and flesh. The name was also applied to those famous piratical adventurers, chiefly English and French, who, in the seventeenth century joined together to make depredations on the Spaniards in America.

BUCK-BEAN, or *Menyanthes*, L. a genus of plants, comprising four species

1. The *trifoliata*, or marsh trefoil, water trefoil, marsh-cleaver, or trefoil buck-bean: it grows in moist, marshy places, in many parts of Britain, and its very beautiful flowers appear in June and July. Dr. WITHERING informs us that cows, horses, and swine refuse it.

Dr. DARWIN recommends these leaves as a substitute for hops; and adds, that they might be equally wholesome and palatable. In dyeing they afford, according to BECHSTEIN, a green and yellow colour.

An infusion of the leaves is extremely bitter, and is prescribed in rheumatisms and dropsies: one drachm of them, in powder, both purges and vomits; and is occasionally given as a vermifuge. Dr. LEWIS considers the *Menyanthes* as a powerful aperient and deobstruent, promoting the fluid secretions. It has of late gained great reputation in scorbutic and scropulous disorders. Inveterate affections of the skin have been cured by an infusion of the leaves taken at proper intervals, to the quantity of a pint in twenty-four hours, and continued for several weeks.

BOERHAAVE cured himself of the *gout*; by drinking the juice of this plant mixed with whey. Stubborn facts, like this, require great authorities.

2. The *nymphæoides*, or fringed buck-bean, or lesser yellow-water-lily, growing in large ditches and slow streams. The leaves of this species are heart-shaped at the base, rounded at the end, sometimes spotted, about two inches long, and swim on the water. Its fine yellow blossoms appear in July and August.

BECHSTEIN relates, that the inhabitants of Japan, where the fringed buck-bean is also indigenous, eat it as a pickle, simply prepared with salt; or, after simmering it in water, and removing the impurities from the top, they use it in broths.

BUCKLER, a piece of defensive armour used by the ancients, commonly composed of hides, fortified with plates of metal.

BUCKLERS, votive, were those consecrated to the Gods, and hung up in their temples, in commemoration of some hero, or as a thanksgiving for a victory obtained over an enemy, whose bucklers, taken in war, were offered as a trophy.

BUCK-THORN, or *Rhamnus*, L. a numerous genus of plants, consisting of 48 species.

1. The *catharticus*, or purging buck-thorn, a shrub growing in woods and hedges, very common in Shropshire, England. It attains, if cultivated, the height of 16 feet, flowers in May and June, and its fruit ripens about Michaelmas. Goats, sheep, and horses, eat the leaves, but cows refuse them. In our markets, the fruit of the black-berry bearing alder, and the dog-berry tree, have lately been substituted for those of the buckthorn. But this species of fraud may be easily discovered by opening the berries: for the genuine kind have generally four seeds, those of the alder two, and those of the dog-berry only one. Besides, buckthorn berries alone, when bruised on white paper, give it a green tint. The wood of this shrub is one of the finest for turnery, produced in Great Britain, as it sometimes grows to a size of six or eight inches in diameter. From the juice of the unripe berries, with alum, a yellow; and from the ripe ones, a fine green dye is obtained: the bark also strikes a yellow and brown red colour. The juice of the unripe berries is of the colour of saffron, and is used for staining maps or paper: that of the ripe berries is the sap-green of miniature-painters, and is much esteemed; but if they are gathered late in autumn, the juice is purple.

BECHSTEIN remarks, that the book-binders in Germany extract this colour by mixing the fresh juice with deep-red, or violet liquids, with which they dye the most beautiful sorts of paper and leather.

In medicine, buckthorn berries have long been esteemed, and a syrup prepared from them is still kept in the apothecaries' shops, though seldom prescribed; as it occasions much sickness and griping. In a late Latin treatise, published by Dr. J. G KOLB, of Erlang, 1794, the bark of the buck-thorn is much recommended as a mild, cheap, and efficacious remedy, in every respect preferable to the berries. After being exposed to the air, or soaked in water, this bark soon assumes a yellow, orange-colour. It contains a considerable proportion of gummy ingredients, which render it a tonic, gently

astringent, and antiseptic medicine. The resinous extract is acrid and astringent, strongly purgative and resolvent: but the bark, in powder, mixed with honey, gum arabic, or any other mucilage, as well as a watery decoction of it, operates mildly, when taken in small doses, for the cure of intermittents: it may also be beneficially employed in slow, putrid, or nervous fevers, and in general debility after chronic diseases. Externally applied, in green wounds, laxity of the fibres, malignant foul ulcers, and in stopping the progress of mortification, this remedy possesses tonic, gently stimulating and healing properties. The decoction is of great service in reducing inveterate inflammations of the eyes, and curing the itch; as it cleanses the skin, and abates the burning heat, without repelling the humours. But it should never be employed in ulcers that have arisen in consequence of erysipelas, or the rose: in other cases its application, will always be more safe, and attended with better effects, when it is at the same time used internally.

2. The *frangula*, or alder buckthorn, or black-berry bearing alder, grows in woods and moist hedges: it generally attains a height of from six to ten feet. The wood of this shrub, when young, is soft and yellow, but becomes hard and light-red with age; its external bark is dark-grey, with white spots, but internally yellow; the branches contain an orange-coloured medullary tube. Its yellowish leaves appear late in May, or June, and sometimes a second foliage comes forth in autumn. The berries are at first dark-green, then become red, and at length black, when fully ripe; containing a sweet, though unpleasant juice. Goats devour the leaves with avidity, and they are also eaten by sheep: the flowers are particularly grateful to bees. The bark dyes yellow, and with iron, black. The berries gathered before they are ripe, dye wool green. Charcoal prepared from the wood, is preferred in making gun-powder. DAMBOURNEY made the following successful experiment with the ripe berries. He bruised them in cold water, and allowed the whole to undergo the vinous fermentation, which took place in eight days. This liquor he boiled for half an hour, and then dyed wool that had been previously prepared with bismuth: thus he obtained a very beautiful green colour, which he called a new, or native green, because it was not in the least affected either by strong vinegar, or a solution of potash. On adding a little sugar of lead to the dye, the vivacity of the colour was considerably increased.

The rind, boiled in milk, is asserted to be a safe and efficacious remedy for eruptions of the skin; yet we do not advise the reader to try experiments with this, or similar remedies without consulting a medical friend. Decoctions of the bark in table-beer, are very certain and brisk purgatives, in dropsies, or constipations of the bowels of cattle.

BUCK-THORN, the *Sea*, or common sallow thorn, the *Hippophæ rhamnöides*, L. is a very important shrub, growing wild on sandy shores, in various parts of the British coast. It sometimes attains the height of eight or ten feet. Its bark is light brown, the wood white, the small leaves of a sea-green colour, but silvery white below. The leaves appear early in spring; the yellow flowers in June and July; the fine red berries late in autumn.

In situations contiguous to the sea-shore, or the banks of rivulets, this shrub eminently deserves to be cultivated, as it is well calculated to bind a sandy soil, and to prevent the water from penetrating through banks and fences. It may be raised from seeds, but more expeditiously by planting layers, or propagating it from the very abundant spreading roots. On account of its thorny points, it affords excellent hedges, even on a sandy soil.

Although cows refuse the leaves of the sea-buck thorn, yet they are browsed upon by goats, sheep, and horses. The berries are strongly acid, with an austere vinous flavour: in Lapland they are pickled and used as spice, but the fishermen of the Gulph of Bothnia prepare from them a rob which, added to fresh fish, imparts a very grateful flavour.

From the leaves of this shrub, M. SUCKOW obtained an agreeable *dark-brown* dye for wool and silk, first treated with vitriol of iron: DAMBOURNEY succeeded in producing a similar colour on cloth that had been previously steeped in a solution of bismuth.

BUCK-WHEAT, *Sarrasin*, the *Polygonum fagopyrum*, L. a species of the *Persicaria*, also called snake weed, bucke, branks, French-wheat or crap. As this useful plant requires no botanical description, we shall proceed to state its most approved method of culture, and

important uses in agriculture; both subjects being intimately connected.

Buck-wheat was introduced into Europe nearly four centuries since, and according to GERARD's Herbal, cultivated in England about the year 1597.

It is a native of the northern parts of Asia. During the last thirty years, it has excited the attention of able agriculturists, who have furnished us with the following result of their experience. This grain delights in a mellow, dry, loose, sandy soil, but does not thrive so well in a free, loamy stone-brash, and should never be sown in wet, poachy ground. It requires little or no manure, but frequent sun-shine. On heaths newly ploughed up, the turf of which has been burnt, or that have been manured with wood-ashes, its vegetation is luxuriant. The proper season for sowing is the last week in July. A shower of rain, after the seed is harrowed-in, greatly promotes its growth, and it generally appears above ground in five or six days.

Buck-wheat is in flower throughout the summer, and would yield much larger crops, if all the grains would uniformly ripen, and could be collected at the same time. About half a bushel is sown on each acre, in this country; and the Germans calculate sixty pounds weight to every hundred square rods of land. From seven to eight weeks only are required for bringing it to maturity, and it produces from twelve to twenty fold. In this state it affords an excellent substitute for hay; and it is affirmed, that the German farmer obtains, at less expense than by mowing and drying the whole, in the usual way, ten times the quantity of corn.

Another variety of this grain was, about a century ago, introduced into Germany, and has lately also been cultivated in Britain, known by the name of *Siberian buck-wheat*. It possesses considerable advantages over the former; because it is not only a fourth part heavier in the grain, but also more palatable, and, in this respect, resembles rice. It thrives in the poorest soil, is not affected by cold, and being more disposed to branch out and spread its stalks, requires scarcely one half of the seed necessary for the culture of the preceding species.

From repeated experiments, made in England, it appears that the culture of buck wheat ought, in many cases, to be adopted in preference to a summer fallowing; as the crop produced is not only so much clear gain, but also affords a considerable quantity of straw for fodder and manure; besides which, it is a more advantageous preparation for the next crop. There will be sufficient time to sow the land with buck-wheat after spring feedings, or a crop of turnip-rooted cabbage, or vetches. When sown in July, buck-wheat is an excellent *sheltering crop to clover;* and two crops of this grain have, in favourable years, been obtained from the same land. Mr ARTHUR YOUNG, in the sixth volume of the "*Annals of Agriculture*," has inserted an instructive paper, communicated by the Rev. R. MOSELEY (Sept. 11th, 1786) from which we learn the following valuable facts: That three crops were sown on the same ground, between autumn and autumn, with only three ploughings, namely, winter tares in September, with one ploughing, which were reaped early in the succeeding summer; then immediately buck-wheat was sown, after one ploughing and harrowing; in September the buck-wheat was ploughed in, and wheat was sown on this *one ploughing*, the crop of which was great. Thus, says Mr YOUNG, as the spring advances, and the sun becomes powerful enough to exhale the humidity of the land, the crop also advances and screens it from the action of his beams. The weeds in the soil vegetating with the young tares, are either strangled by their luxuriance, or cut off with them, before they produce seed. This crop is cleared from the land so early, that the soil would remain exposed to the sun for three months, in the most scorching heat of the summer; and, if thus left exposed, the three ploughings would be hurtful to the soil, except that they might destroy some weeds. Hence to give one ploughing *immediately*, and harrow in buck-wheat, saves expense; and the growing herbage shades the earth, when it most requires to be protected: by this management, a dressing of manure is gained at the cheapest possible rate. In short, to introduce a system more *complete* is not in the power of science.

It appears to be undecided, whether buck-wheat improves or impoverishes the soil. There can be no doubt that it will produce the latter effect, like all plants that are suffered to run to seed; and, on the contrary, that it renders the soil more fertile, when ploughed in, before the seeds are formed. [This is an excellent method of manuring for a full crop, but it ought to be turned in by Ducket's plough.—T. C.]

Hogs feeding upon this vegetable are liable to scabby eruptions.

Buck-wheat should be sown thin, because the top blossoms are very apt to be burnt by the sun, in which case the under ones will be saved, as they spread out and protect one another from the sun. If sown thick, the plants cannot throw out under branches. If the grain stands, when ripe, it may be cradled; but when it has fallen, the scythe must be used, and the crop permitted to lie three days, then raked while the dew is on to prevent the grain shedding; then threshed by horses.

Buck-wheat answers very well with clover. Sow the buck-wheat first and harrow; then sow the clover seed, and let the roller follow immediately. In this way the land will be sown even, and the ground made level for the cradle. The advantages of the buck-wheat are, that it preserves the moisture of the land, in case a dry season should follow; shelters the clover till the month of Oc when the buck-wheat is cut: after which the sun can no longer injure the clover, but gives it a due portion of warmth, and pushes it forward until the cold of winter locks up all vegetation.

With respect to the question, whether buck-wheat is, or is not an exhauster of the soil, a positive answer may be given. A field intended for barley, was partly sown with buck-wheat, and when in blossom in September it was ploughed in; the other part of the field was left fallow until seed time. In the succeeding season, the barley growing on the part in which the buck-wheat had been ploughed, was evidently superior to that which grew on the fallow part. This experiment, made by a plain farmer, on the Germantown road, with a laudable view of determining the question, leaves no room to doubt, that *buck-wheat ploughed in, when in full blossom, acts as an excellent green dressing manure.*

The straw of buck-wheat is but little esteemed. Sheep, however feed on it. It also makes good manure when thrown into the farm yard.

For culinary purposes, also, the grain of the buck-wheat is used in various forms, and affords a nutritious meal, which is not apt to turn sour on the stomach. Mixed with barley, it is, in Tuscany, baked into bread, which possesses the property of retaining its moisture much longer than that of pure wheat; and though of a darker colour, it is equally nourishing. In Germany, a very palatable grit, or a granulated meal, serving as an ingredient in pottage, puddings, &c. is prepared of buck-wheat; and if the seed be pure, the produce of each bushel is ten pecks. In the electorate of Brandenburgh, not only ale and beer is brewed from a mixture of it with malt, but likewise a very excellent spirit of a blueish shade is obtained by distillation; the flavour of which resembles that of French brandy. The taste and colour of stale beer, may be much improved by adding a small quantity of the flour of this grain.

Buck-wheat reduced to flour, mixed with water, and a little yeast, will rise in the course of two hours, if placed near a fire; and being then baked upon a hot iron, previously greased, forms very pleasant cakes, which when buttered, constitute part of the diet of many persons in the United States during the winter. By depriving the grain of its husk before grinding, the flour is rendered white, and is much esteemed.

From the fresh blossoms of these plants, DAMBOURNEY dyed wool, prepared with bismuth and tin, of a beautiful brown colour; and, from the dried flower-bundles, different shades of green. Those of the Siberian species, in particular, yielded a fine yellow, which, on boiling the wool still longer in the dye, changed into a golden tint, and at length assumed a brilliant yellow.

[Buckwheat ferments easily, hence in Pennsylvania for winter use, distillers now take $\frac{1}{3}$ rye, $\frac{1}{3}$ corn, $\frac{1}{3}$ buck-wheat: but the spirit is not so good as when nothing but rye is used. It is the most unwholesome grain that can be given to horses: and from the quantity of butter used with it, the most extravagant grain used for the table in our country.—T. C.]

BUCKING, one of the operations performed in the whitening of linen cloth, or yarn See BLEACHING.

BUCKRAM, is coarse linen cloth, stiffened with glue, and used in the making of garments, to keep them in proper form. It also serves for wrappers to cover cloths, serges, and other articles of merchandise, in order to preserve them from being soiled, and prevent their colours from fading. In general, old sheets and pieces of cloth are converted into buckram; but sometimes new pieces of linen cloth are used for that purpose. Buckrams are sold wholesale by the dozen of remnants, or small

pieces of about four ells long, and of different breadths.

BUD, in botany, the embryo or rudiment of a plant, growing on the stems and branches of trees, and covered with scales, or with a resinous varnish, to protect it from the winter cold, and from the depredation of insects. Buds proceed from the extremities of the young shoots, and along the branches, sometimes single, sometimes two by two, either opposite or alternate, and sometimes collected in greater numbers. In general, we may distinguish three kinds of buds: the leaf-bud, the flower-bud, and that containing both in one covering. The first species contains the rudiments of several leaves, which are variously folded over each other, and surrounded by scales. The second species, or flower-bud, contains the rudiments of one or several flowers, folded and covered in a similar manner. This bud is called by Pliny *oculus gemmæ*, or the eye of the bud, and is employed in that species of grafting, called *inoculation*. The third sort, which is the most common of any, produces both flowers and leaves. Buds, together with bulbs, which are a species of buds, generally seated on, or near the root, are very properly called by Linnæus *hybernacula*, a term signifying the winter-quarters of the embryon shoot.

As plants are supposed to bear a striking analogy to animals, they may not improperly be reckoned both viviparous and oviparous; in which view, seeds may be considered as vegetable eggs; buds, as living fœtuses, or infant plants, which renew the species as certainly as the seed.

As each bud contains in itself the rudiments of a plant, and would if separated from its parent vegetable, become in all respects similar to it, Linnæus, to shew the wonderful fertility of Nature, has made a calculation, from which it appears that in a trunk scarce exceeding a span in breadth, no less than ten thousand buds may be produced. How great then must be the number of plants, which are capable of being raised from one large tree! See the article Leaves.

Flower-buds of many trees, says Dr. Darwin, arise immediately from the terminating shoots or spurs of the preceding year, and are either accompanied with leaf buds or separately, as in apple and pear-trees. Others proceed from the shoots of the present year alternately with leaf-buds, as those of vines, and form the third or fourth buds of the new shoots. They differ from leaf-buds, because they perish when their seeds are ripe, without producing any addition to the tree; the leaf-buds, on the contrary, decay in autumn, and their caudexes are then gradually converted into alburnum, or sap-wood; over which the new leaf-buds shoot forth their caudexes and radicles, or insert them into it, and gradually fabricate the new bark and root fibres.

Some of the disciples of Linnæus are of opinion, that about midsummer leaf-buds may be changed into flower-buds, or flower-buds into leaf-buds; and this may be effected even after the vegetable embryons are generated, by weakening or strengthening the growth of the last year's buds. Hence, if some inches of a branch be lopped off at Midsummer, which is sometimes done by unskilful gardeners, the remaining buds on that branch will become more vigorous, and produce leaf-buds instead of flower-buds. But the contrary effect will take place, if a vigorous branch of a wall-tree be bent beneath the horizon, so as to impede the generation of new caudexes.

BUDDING, a method of propagating fruit trees. The stocks are raised from seed; and in these, buds of other trees are inserted, which invariably produce the same kind of tree, fruit and flower, as those from which the buds are taken.

BUFF, in commerce, a sort of leather prepared from the skin of the buffalo, which, when dressed with oil after the manner of chamois, makes what we call buff-skin. This is a very considerable article in the French, English, and Dutch commerce at Constantinople, Smyrna, and along the coast of Africa. The skins of elks, oxen, and other like animals, when prepared after the same manner as that of the buffalo, are likewise called *buffs*. [Also a kind of yellow colour, made by dipping cotton, linen, or woollen, in a solution of green vitriol, and then in lime water.—T. C.]

BUFFALO, (*Bos bubalus*) is a species of ox which has large horns of compressed form, with the outer edge sharp, growing straight for a considerable length from their base, and then bent slightly upward: on the shoulders there is a bony protuberance; and the general colour of the hair is black or dusky.

In a wild state these animals are natives of Asia and Africa; and they are domesticated in India, and in some of the warmer parts of Europe.

Although the buffalo is naturally a savage and ferocious beast, yet when properly trained it is rendered very serviceable to mankind. These animals are used both for draught and burden, and are sometimes even trained for the saddle. They are guided by a cord attached to a ring, which is made to pass through the cartilage of their nose. Two buffaloes harnessed to a carriage are considered able to draw as much as four horses.

The *milk* of the buffalo, though not so good as that of the cow, is in greater quantity, and in much esteem. *Ghee* is a kind of butter made from the milk of these animals and clarified. This is an article of commerce in various parts of India, and is generally conveyed in bags or bottles made of the hide, each of which holds from ten to forty gallons. The *flesh* is said somewhat to resemble beef, but to be of a darker colour: that of the calves is considered peculiarly delicate. Of the *skin* is made a strong and durable leather, which, under the name of *buff* leather, is applicable to a great variety of uses. The *horns* have a fine grain, are strong, and bear a good polish: and are therefore much used by cutlers and other artificers. They are occasionally imported into this country from Bengal.

These animals usually associate in large herds, in marshy woods and plains. So great is their ferocity that the hunters are at all times fearful of attempting to kill them, unless they are perfectly sure of their aim. They swim over even the widest rivers with a facility which can be equalled by few quadrupeds.

The Cape Buffalo (*Bos cafer*) is an excessively strong and ferocious beast of the ox tribe, which has thick horns, that are rugged at the base, and lie so flat as to cover almost all the top of the head.

These animals are found in herds of a hundred and fifty or two hundred together, in the plains of Caffraria, and other parts of the south of Africa.

There are no animals of the ox tribe so savage, so much dreaded, nor so wantonly mischievous as these, attacking and destroying mankind without being themselves previously assailed, and committing devastations of the most alarming kind in the neighbourhood of the places where they are found. They are killed on account of their *flesh*, which is lean, but juicy and of high flavour; and also on account of their *hides*, which are so thick and tough that even musket-proof targets are formed of them. Of these hides also the strongest and best thongs for harness are made. The Hottentots, who are never inclined to take much trouble in dressing their victuals, cut the *flesh* off into slices, and then smoke, and at the same time half broil it over a few coals. They also frequently eat it in a state of absolute putrefaction.

Some successful attempts have been made in the Western Country to domesticate this very powerful animal. When taken young they are broken to the yoke with as little trouble as common steers. Considering the uncommon strength of this animal, which is twice as great as that of oxen, and the great numbers that are annually killed by the hunters, in the wilds of the Western World, it is surprising that they are not upon every farm on the Mississippi and Ohio. It is very probable that a cross with a common cow might produce a highly valuable breed, and it is an experiment worthy of the numerous enterprising characters residing in that extensive country.

BUG, in zoology, a species of *cimex*, too well known to need any description. Of the various recipes for the extirpation and prevention of these vermin, the following have been found by experience, to be the most effectual:

1 Take of the highest rectified spirit of wine, half a pint; newly distilled oil, or spirit of turpentine, half a pint: mix them together, and crumble into it an ounce of camphor, which will dissolve in a few minutes: shake the whole well together, and with a piece of sponge, or brush dipped into it, anoint the bed, or furniture, in which those vermin harbour and breed; and it will infallibly kill and destroy both them and their nits. Should any bug, or bugs, happen to appear after once using it, the application must be repeated, and at the same time some of the mixture poured into the joints and holes of the bedstead and head-board. Beds that have much wood work, require to be first taken down, before they can be thoroughly cleared of these vermin; but others may be perfectly cured without that trouble. It is advisable to perform this work in the day time, lest the spirit contained in the mixture take fire from the candle, while using it, and occasion serious damage:

2 [Or, Dissolve 100 grains of corrosive sublimate in a pint of brandy, or whiskey: use it with the feather of a quill. —T. C.]

5. Half an ounce of corrosive sublimate, powdered and dissolved in a quart of spirits, makes an effectual wash for bedsteads infested by bugs. They must be previously scrubbed with cold water, and well dried

BOUTCHER in his treatise on forest trees, asserts that bedsteads made of the Yew Tree, are never infested with bugs. [Sed quere? In England, cast iron bedsteads are much in use for hospitals, &c. and they certainly are good, as affording no harbour for vermin. —T. C.]

BUILDING is the art of constructing and raising an edifice: in which sense it comprehends as well the expenses, as the invention and execution of the design.

In the practice of this useful art, there are five particulars to be principally attended to: 1 Situation; 2. Contrivance, or design; 3. Strength and solidity; 4. Convenience and utility; and 5. Elegance. As our aim is not to impart elementary instructions in the art of building, we shall only sketch the most essential rules, by an attention to which, the reader may be enabled to discriminate between good and bad building, and to guard against many common errors.

In laying the foundation of a building, proper care should be taken to ascertain the nature of the soil, either by a crow or rammer; or, which is still better, with a miner's or well-digger's borer, in order to discover whether it is thoroughly sound, and fit to bear the weight that is to be laid upon it.

With regard to *situation*, a dwelling-house ought never to be erected near marshes, fens, or a boggy soil, nor too close on the banks of a river, unless it stand on rising ground, at the north or west side of the bank See COUNTRY-HOUSE and FARM-HOUSE

Contrivance, or *design*, is of the first importance in building, as a skilful architect will not only make the structure handsome and convenient, but often save great expenses; which cannot be avoided when, by hasty and injudicious management, any future alterations become necessary. A model is the most certain way to prevent mistakes, and is superior to the best draughts. But if the latter be adopted, they should be of the largest size, so that the delineation of all the chimneys, hearths, bed-places, stairs, and the latitude of all doors and windows, in each floor, may be distinctly represented: and if the workmanship be agreed upon by the bulk, it will be useful (for obviating differences and disputes) to insert the length and thickness of the ground plates, breast-summers, girders, trimmers, joists, raisings, and wall-plates; as also the thickness of the walls, partitions, &c In timber buildings, the several sizes of the ground-plates, interduces, breast-summers, beams, principal port-braces, quarters, window-posts, door posts, cellar-beams, principal rafters, &c &c. should also be minutely ascertained.

Instead of expatiating, in this place, on the strength, utility, and elegance of buildings, it may not be improper to give an abstract of the principal acts of parliament passed on this important subject; and afterwards compare the ancient method of building with modern improvements On re-building the city of London, after the great fire in 1666, it was enacted, That in every foundation within the ground, one brick be added to the thickness of the wall next above the foundation; that no timber be laid within the funnel of any chimney; and that the proper size of timber for ordinary buildings be adapted to certain proportions specified in the act.

For the regulation of building within the Bills of Mortality, and in other specified places, it was enacted in the eleventh year of GEORGE I and the fourth of GEORGE III. that *party walls* must be erected of brick or stone; which shall be two bricks and a half thick in the cellar, two bricks thick upward to the garret floor, &c Besides, there were several other limitations made respecting the size and disposition of the timber. Every building is to be surveyed, and the person who offends against the statute, in any of the particulars recited, is liable to a penalty of 250*l*. [Some regulations of a similar nature to the above, ought to be introduced in the United States —T. C]

From the description given in the 493d number of the *Philosophical Transactions*, by Mr ARDERON, it appears that the ruins of two old towers, belonging to the Roman camp at Castor, in Norfolk, were built in the following ingenious manner: They began first with a layer of bricks, laid flat as in pavements; on that they placed a layer of clay and marl mixed together, and of the same thickness with the bricks; then a layer of bricks, afterwards of clay and marl, then of bricks again; making in the whole, three layers of bricks, and two of clay. Over this were

placed bricks and lime twenty-nine inches, the outside being faced with bricks cut in squares; then brick and clay alternately, as high as the old ruins now remain standing. He adds some remarks on the hardness of the mortar, and durableness of the bricks, the length of which last is found to be 17,4-tenths inches, or a *Roman* foot and a half; their breadth 11,6-tenths inches, or precisely a Roman foot; and their thickness only 1,3-tenths of an inch. This last circumstance deserves particular notice, and we therefore refer the reader to the article BRICK.

Various plans have lately been devised for securing buildings and ships against fire. We shall, however, only mention that of DAVID HARTLEY, Esq. who, in April, 1773, obtained a patent for his invention of applying plates of metal and wire, varnished or unvarnished, to the several parts of buildings of ships, so as to prevent the access of fire, and the current of air; securing the several joints by doubling in, overlapping, soldering, rivetting, or any other manner closing them up; nailing, screwing, sewing, or otherwise fastening the said plates of metal, in, to, and about the several parts of buildings and ships, as the case may require. Convinced that this method would be too expensive for common buildings, and that it does not afford sufficient security against violent flames, when the contiguous buildings are actually burning, we shall suggest other and more effectual means of protection under the article FIRE.

A very capital error in buildings in the United States is, the thinness of the walls. A house with thin walls, is both cold in winter, and hot in summer; a house with thick walls just the reverse. To the N. W. and N. E. in particular, the walls ought to be three times the common thickness. See HOUSE.

The opportunity here offered, cannot be omitted of bearing a testimony against the common but uneconomical, unhealthy and dangerous practice of erecting wooden buildings, particularly in cities. The evil, however, will correct itself. The frequent fires in Boston; the almost entire destruction of Savannah a few years since, and the recent conflagration of Portsmouth, N. H. speak more forcibly than words, as to the propriety of abolishing the custom of building with wood. It is to be regretted, that in the United States advocates for wooden structures are found. To such the following observations are offered.

By building of wood, much immediate as well as remote inconvenience, is to be expected; and certainly, however suddenly felt may be the comfort arising from an increase of despatch, the numerous considerations of perishableness, want of safety, and call for repairs, added to the reflection, that the public taste is, for the time, deprived of one great field of exertion, will very much weigh with an enlightened people, when once they become awakened to their advantages, and proud of the singular novelty of their physical and moral opportunities of situation.

Wood, considered as a material of architecture, is not only perishable, but it is fearfully accessible to all the dangers of wind and fire, and is not so strong as brick or stone. To these objections may be added, the consideration, which will weigh with the man of taste, that wood is unsusceptible of chaste ornament. If it be adorned, it is in a finical puerile taste, in which there is as great a distance from the simplicity of the Grecian, as variance from the whimsical, yet often pleasantly fanciful assemblage of the Gothic style.

Bachelors only ought to build of wood: men who have but a life estate in this world, and who care little for those who come after them. Those who have either children or a wife to leave behind them, will build of brick, if they wish to leave monuments of kindness, rather than a rent-charge, behind them. A well-finished brick house, however small, is not only more elegant, and immediately useful and safe, but it is cheaper in the end than a wooden one. It needs fewer repairs: its prime cost is little more: it is a property which yields more, inasmuch as, if rented out, it carries from the per cent. of rent, fewer of the eating repairs, which render the profits of wooden rent-rolls, so equivocal and precarious. With respect to insurance, which in all populous places sooner or later takes place, it bears an analogy to policies on annuities, where one subject lingers under a precarious existence, and the other is blessed with youth and a sound constitution. In point of ease, taste, and duration, there can be no hesitation between them. The whole doubt in the mind of a builder rests in the competition between immediate convenience and the remote advantage of an unknown duration; for a good brick house will be habitable for centuries.

Considered politically, and in this

government every citizen is on the watch of public happiness and political warfare, there is this good attending brick buildings; from durable habitations, in which more money has been spent, and more of the refined tastes gratified, an affection for the soil is increased. A habit of thought arises, favourable to population: a greater proportion of money is thus realised. The great national fund of course is augmented, fixed to the soil, and pledged to society.

The last and highest consideration is, that migration would be less easy, and not so common, were a finer spirit of building to prevail. Were the Tartars to build houses instead of waggons and tents, as Baron Tot says they still do, and as they did when the Huns impelled the Goths against the feeble Roman empire, they would not rove, and their country might become a land of tillage. The facility with which we may move, is a strong incentive to that love of change which it particularly interests us to repress in our citizens.

[There is great good sense in these observations of Dr. Mease, and I hope they will be attended to.

As to stuccos, mortars and cements, they are best sought for under those words. I would observe, that in private dwellings it would, in my opinion, be desirable,

1. To have the foundation story of every three-storied house, never less than 2 bricks thick, and to choose the best-burnt bricks for the purpose: the next story not less than 1½ brick, and the walls grouted to prevent currents of air in case of contiguous fire; the upper story one brick. The roofs should *never* be shingles, but either slate, tile, or zinc.

2. The stuccoed and brick painted floors of France and Germany are beyond comparison, more safe, more comfortable, more cleanly, and more salubrious, than the combustible deal floors, that are impregnated with dirty water, at least once a week, in the cold and damp winter climate of England and North America. It is really surprising to see this sacrifice made by the intelligent part of the community to the prejudices of the lower and most ignorant part of the female sex.

3. No person who has been accustomed to a stove room of bricks, tiles, soapstone, or even iron when moderately heated, will willingly burn his face, his eyes, and his shins before the scorching glare of an open fire, while his back is shivering, and his heels in danger of being frost-bitten. No person wishing for a patent right for wasting wood, and making sitting rooms unwholesome, expensive, and uncomfortable, could devise a more effectual method than modern fire-places. Foreigners look with astonishment at this remnant of British ignorance and prejudice. Open fires produce complaints of the breast, catarrhs, and in females, consumptions, as well as premature decay of eyesight. How seldom is it that one half of a dinner party in the winter do not look with envy at the opposite guests who hide the fire, and whose backs are roasting at the same time in payment for the privilege? Stoves in the passage, and stoves in the rooms, would remedy this troublesome and expensive evil; and they might be made elegant enough in their form and decorations to satisfy the female eye. If to this improvement were added the European continental custom of double doors and double windows, with a current of air from without to feed the fire, and an aperture in the upper part of the room to carry off the vitiated air, we should have an accession of comfort, which the generality of people are not aware of among us. Luckily the high price of wood in our seaport towns, will force us into some such measure of common sense.

4 The common bricks wherewith the houses are usually built, are so ill burnt in America, partly owing to ignorance, and partly to the scarcity of wood, that walls are generally damp. A brick immersed in water, will imbibe about a quarter of a pound of moisture in ten minutes. Consider the effect of two or three days of rain on walls thus built. The house can neither be perfectly dry, or lasting. To be quite dry and salubrious, it is not only prudent to choose the best burnt bricks for the outside, but it should be stuccoed on the outside and battened within.

5. If buildings are meant to last long, *polished* marble or porphyry, or siliceous sandstone stuccoed, are the best materials. Next the hornblende and quartz rocks; granite contains decomposable feldspar. Polish adds greatly to durability. Grouting the interstices of the materials, with mortar nearly liquid, as the building proceeds, still more.

6. Houses built of unpolished stone, should be stuccoed, or white-washed with fresh lime, else they imbibe water Care should be taken to keep the gutters tight

7. Every house should have a trap door, as a means of escape on the roof, in case of fire below.

8. Where buildings are of frame, they should be heated inside by steam conveyed from a distant boiler, into pillars, obelisks, or some ornamental receptacle of steam inside the rooms. This is becoming very common in England.—T C]

BULB, in botany, a kind of large *subterraneous bud*, though sometimes appearing above ground, upon or near the root of certain herbaceous plants, which are therefore denominated *bulbous*. LINNÆUS considers the bulb as the winter-quarters of the future vegetable, because every bulb contains, in miniature or embryo, a plant, in all respects, similar to its parent; so that many plants and trees may be propagated, with equal facility, by the bulbs or buds, as well as by the seeds

The tender rudiments of the future vegetable, of which the bulb or bud is composed, are inclosed, and, during the severities of winter, defended against cold and other external injuries, by a hard bark or rind, which generally consists of a number of scales, placed over each other, like tiles, and fastened together by means of a tenacious, resinous, and frequently odoriferous substance. Thus defended, the buds remain upon different parts of the mother plant till the ensuing spring.

Bulbs are distinguished from *buds*, by this circumstance, that the former are generated on the broad caudex of the plant within the ground, or in contact with it, and immediately shoot down their roots into the earth; whereas, buds are formed above the soil, on the long caudexes which constitute the filaments of the bark of trees, and shoot down new roots from the lower end of those elongated trunks.

Dr. DARWIN observes, that bulbs may be divided into leaf and flower-bulbs When a tulip seed is sown, it produces a small plant the first summer, which in the autumn dies, and leaves in its place one or more bulbs. These are *leaf bulbs*, which, in the ensuing spring, rise into stronger plants than those of the first year, but no flowers are yet generated; in the autumn these perish like the former, and leave in their places other leaf-bulbs, stronger or more perfect than their preceding parents. This succession continues for four or five years, till at length the bulb acquires a greater perfection or maturity, necessary for seminal generation, and produces in its place, a large flower-bulb, in the centre, with several small leaf-bulbs around it.

This successive formation of leaf-bulbs, in bulbous-rooted plants, previous to the formation of a *flower-bulb*, is curiously analogous to the production of leaf-buds on many trees for several years, before the production of flower-buds: thus, apple-trees, raised from seeds, generate only leaf-buds for ten or twelve years, and afterwards annually produce both flower and leaf-buds. Hence it appears, that the adherent lateral or paternal progeny, being the most simple and easy, is consequently the first mode of re-production; and that the propagation by seed is not accomplished till the maturer age or more perfect state of the parent-bud.

Bulbous-roots are said to be *solid*, when composed of one uniform lump of matter, as in the tulip; *tunicated* or coated, when formed of a plurality of coats, surrounding one another, as in the onion; *squamous* or scaly, when composed of lesser scales, as in the lily; *jointed*, as in the tuberous moschatel; *duplicate*, when there are only two bulbs to each plant, as in the crocus and saffron; and aggregate, when there is a congeries of such roots to each.

One of the most striking phænomena in vegetable nature is that of raising plants from their bulbs, *without earth*. DUHAMEL even raised small *oak trees*, merely by water, in which he kept them eight years. they produced fine leaves every spring, and grew more rapidly during the two first years, than if they had been planted in the best earth: an useful hint this to the cultivators of that noble tree!

As bulbs immersed in water produce roots, stems, and leaves, we might be induced to think, that the order of their growth, in these different parts, would be alike; but experience evinces the contrary. DUHAMEL cut off some of the largest hyacinth-roots, almost two fingers breadth from their ends; then placed the bulb on a bottle, in such a position that the end of the cut root touched the water; and made a mark on the outside of the bottle, exactly opposite to the extremity of the root; he likewise made marks corresponding to the ends of some entire roots. The latter continued growing, and soon extended beyond the mark of their former length; but the ends of the cut roots remained stationary. This experiment clearly demonstrates, that roots only grow at their end.

BULFINCH, or *pyrrhula*, a species of bird comprehended under the genus *Loxia*, and so generally known as to require but little description. The head, wings, and tail are black; the breast and belly red; the upper tail, coverts and vent, white; and the breast of an ash-colour. In the female, the under parts are of a reddish brown. This bird is common in most parts of the Continent, and throughout Russia and Siberia, at which last places it is caught for the table. It is also pretty general in England, and builds in bushes, five or six feet from the ground. The nest is principally composed of moss, and the eggs, which are five or six in number, are of a blueish white colour, marked at the large end with dark spots. The time of breeding is about the end of May, or the beginning of June; and in summer its principal residence is in woods; but in winter it approaches gardens and orchards, and is, perhaps, unjustly stigmatised for destroying the buds of trees, though it appears that its object is not the bud itself, but "the worm in the bud," and that the bulfinch is one of those species of birds that defend the embryo fruit, by destroying the nests of innumerable insects, and thus promote their growth. In its wild state, the bulfinch has a simple note, but when tamed, it becomes remarkably docile, and may be taught to whistle any notes, or even a whole tune, in the most accurate manner. There is a considerable number of these birds annually imported from Germany into England, some of which are even taught to speak, but they are remarkable for imitating wind-music, particularly flagelets.

When bulfinches are taken young, they may be reared in the same manner as a linnet. The best way to distinguish the cock of this bird from the hen, is, to pull half a dozen feathers from its breast, when about three weeks old, and in ten or twelve days after, they will appear of a brightish red.

BULIMY, a disease in which the patient is affected with an insatiable and perpetual appetite for food; and, unless he is indulged, he falls into fainting fits: we have a well authenticated account of a person afflicted with this disease, who devoured 879 lbs. of meat and drink in six days, nevertheless he lost flesh rapidly.

BULL, or *Bos Taurus*, in zoology, is naturally a fierce and terrible animal, having cylindrical horns, bent outward, and loose dewlaps. When chased, he has a majestic and sullen air, often tearing up the ground with his feet and horns A bull, like a stallion, ought to be the most handsome of his species. He should be tall and well made; his eyes large and protuberant, black and rolling; his forehead broad, and close set, with short curled hair; his ears long, hairy within and without; his horns longish, clean and bright: and as Nature has designed the head as his principal instrument, both of offence and defence, it ought to have every mark of strength, and also to be proportionably aided by the neck The large muscular neck, provided it be well proportioned, in its parts, and the head firmly connected therewith, of all others deserves the preference. It ought not, however, to be encumbered with a coarse wreathy skin and dewlap; the latter, on the contrary, ought to be thin and supple, and the former tight and smooth The breast should be large, and the shoulders deep, thick, broad, and high; the back straight and broad; the ribs broad and circular; the belly deep, straight, and tapering a little to the hind thighs, which should be large and square. The roof ought to be wide, particularly over the chine and hooks; and the tail (if the bull is of the true *English* breed) should not extend far up the roof, and be strong and deep, with much lank hair upon the under part of it; and the hind part of the buttock rather square than exuberant; from which mark, there is an absolute certainty he does not partake of the buffalo, or muscular-thighed breed, which are the worst feeders. The joints and legs should be short and strong; and the body long, deep, and round, filling well up to the shoulder, and into the groin.

The finest breed of bulls, and other cattle, ever reared in England, was that of the late Mr. Fowler, of Rollright, Oxfordshire, whose stock was sold by auction, in 1791. The English editor of this work (Dr. Willich,) was among those who witnessed this enchanting exhibition of animals, and admired their incomparable size, form, vivacity, in short, the most picturesque view, both as to objects and scenery. Here the most respectable farmers of the first agricultural country in Europe had assembled; some of whom had travelled several hundred miles, from almost every corner of the island. Fifteen prime heads of cattle, namely, five bulls, and ten cows, were separately sold for the

enormous sum of 2464*l.* or, on an average, 164*l.* each: the finest bull, named *Sultan*, only two years old, was purchased by Messrs. FREEMAN and EDEN, of Gloucestershire, at the price of 220*l.* 10*s.* Such was the reputation of that celebrated breeder, Mr. FOWLER, that FREDERICK the Great, of Prussia, honoured him with his correspondence, and rewarded him with a gold medal.

By well known artificial means, the nature of this animal is remarkably softened, and all his impetuosity destroyed, without diminishing his strength: on the contrary, after this operation, which is usually performed before he is two years old, his weight is increased, and he becomes more fit for agricultural purposes.

The age of these animals may be distinguished by the teeth and horns; the first four teeth drop out at the age of six months, and are succeeded by others of a darker colour, which are broader than the former. When they are sixteen months old, the next milk-teeth likewise fall out, and at the commencement of the fourth year, all the fore-teeth are renewed. The bull, cow, and ox, naturally live from fifteen to twenty years: but are generally killed at an earlier age.

These animals are extremely fond of licking themselves, especially when lying at rest; but this practice should, as much as possible, be prevented, for the hair being an indigestible substance, remains in the stomach, where it becomes coated with glutinous matter, which, in time, forms hard balls, and not unfrequently proves destructive. We conceive that small quantities of common salt, or, preferably, rock-salt, occasionally exposed to cattle for licking it, would not only preserve their health, in general, but also tend to obviate the effects of the unwholesome practice before alluded to.

Dr. LYSONS informs us, in his "*Practical Essays*," 1772, that the *epilepsy* in bulls, is sometimes occasioned by *hydatids* (little transparent bladders filled with water,) or other matters immediately acting upon the brain; and he relates an instance where this formidable case was cured by the operation of *trepanning*, performed by Mr. CHESTON, a very ingenious surgeon, at Gloucester, England.

The Common Ox (*Bos taurus domesticus*,) is characterised by having rounded horns which curve outward; and a loose skin or dewlap beneath the throat.

The male is called *bull*, the female *cow*, and the young one *calf*.

This animal in a wild state is the *bison*, which is found in the marshy forests of Poland and Lithuania.

It is almost impossible to enumerate all the benefits that mankind derive from these admirable animals. In many countries nearly the whole labour of agriculture is performed by oxen, and after this service is over they are fatted and slaughtered for food. It is well known in what estimation they were formerly held in Egypt; they furnished even deities to the superstitious inhabitants of that country. From their supplying the Gentoos with milk, butter, and cheese, their favourite food, those people even now bear for them a veneration so great that nothing on earth would induce them to slay one of them.

In nearly all eastern countries oxen are employed in treading out corn. By the Caffres of the Cape of Good Hope they are used as beasts of draught and burden. When Mr. BARROW and his suite went into the country of the Caffres, the king, who was at a distance from his usual residence, was sent to; and he is stated to have arrived riding upon an ox full gallop, attended by five or six of his people.

To the *milk* of the cow we are indebted for several important articles of human subsistence. It is adapted to every state and age of the body, but particularly to the feeding of infants after they have been weaned. Skimmed milk, or that which remains after the cream has been taken off, is employed in considerable quantity by wine and spirit merchants, for clarifying or fining down turbid white wine, arrack, and weak spirits.

Nearly all the *cheese* that is consumed in the British islands is made of cows' milk. For this purpose the milk is curdled by mixture with a substance called rennet, which is prepared from the inner membrane of a calf's stomach; and the curd thus formed, after being cleared of the whey or watery part contained in the milk, is collected together, pressed and dried for use.

The principal of all the English kinds of cheese is that called *Stilton cheese*. This however is not, as its name would import, made in the town of Stilton, but in various parts of Huntingdonshire, and in Leicestershire, Rutland, and Northamptonshire. Stilton cheese is indebted for its excellence both to the rich pastures on which the cows

are fed, and to the peculiar process by which it is made. It is not sufficiently mellowed for use until two years old, and is not in a state to be eaten till it is decayed, blue, and moist. To hasten the ripening of Stilton cheese it is not unusual to place them in buckets, and cover these over with horse-dung. *Cheshire* is famous for its cheese, which is generally much salter and more smart upon the palate than any other English kind. In *Wiltshire* and *Gloucestershire* much cheese of rich and very excellent quality is made. The neighbourhood of *Chedder*, in the county of Somerset, produces a very admirable kind, which, if good, is little inferior in taste to Parmesan, and is supposed to owe its peculiar quality to the cows feeding in rich pastures, and particularly on the *flote fescue* grass (*Festuca fluitans*,) with which many of those pastures abound. *Cottenham cheese* is a soft white cheese, for which we are chiefly indebted to a small village of that name situated a few miles from Cambridge. In the neighbourhood of *Bath* and *York*, and also in *Lincolnshire*, a rich and excellent kind of cream cheese is made. It is used when but a few days old, and is chiefly sold to be eaten with radishes, salad, &c. In Scotland a species of cheese is produced which has long been known and celebrated under the name of *Dunlop cheese*, from a parish of that name in Ayrshire, in the neighbourhood of which it is principally made.

Of foreign kinds of cheese the most celebrated is *Parmesan*. This is made of ewes' milk, or of a mixture of ewes' or goats' milk with that of the cow. We receive it from various parts of Italy, and also from other countries, although the name would import it to be made exclusively in the neighbourhood of Parma. In the district of *Gruyere*, a small town in the canton of Friburg in Switzerland, a well known kind of cheese of large size is made which goes by that name. *Gouda cheese* is famous in Holland, and was celebrated in this country while it was to be procured; but during the long interruption of our intercourse, in consequence of war, it has of late been seldom seen. The common *Dutch cheeses* are of globular shape, and each three or four pounds in weight. They are prepared in the same manner as Cheshire cheese, with the exception that instead of rennet the Dutch use spirit of vitriol (sulphuric acid) Hence this kind of cheese has a sharp and saline taste, which is said to exempt it from the depredations of mites. *Green Swiss cheese* has a strong and peculiar flavour derived from the fragrant powder of melilot (*Trifolium melilotus officinalis*). This cheese is, however, to many persons very disagreeable.

When milk has been suffered to stand a few hours, a substance called *cream* rises to the surface. This is skimmed off for several uses, but principally for the purpose of being collected to be made into *butter*, which is done by beating it in a vessel called a churn. In Cheshire it is customary to churn the butter from the whole milk without its being skimmed, but this is contrary to the practice in most other parts of England. The consumption of butter is so great that not less than 50,000 tons weight of it are stated to be annually used in London. That which is principally in esteem there is produced in Essex, and known by the name of *Epping Butter*.

To make butter keep for a greater length of time than it would otherwise do, it is salted, and in this state is packed in small tubs or barrels, and is a very considerable article of commerce. In the salting and packing of butter many abuses are practised to increase its bulk and weight, against which there is an express act of parliament. Lumps of good butter are sometimes laid for a little depth at the top of a barrel, with butter of an inferior quality under it. Sometimes the butter is packed hollow; and sometimes the exterior part of the butter is good whilst the whole interior part is bad.

After the butter has been separated there remains in the churn a kind of whey which is called *butter-milk*, and the quality of which greatly depends on the manner of churning. Before it turns sour, butter-milk is a favourite beverage in the families of some farmers. It is also occasionally used as a wash for the face, being considered a remedy against freckles; but it is principally applied to the feeding of pigs.

The flesh of oxen constitutes the kind of food which we call *beef*. This is usually eaten in a recent state, but is sometimes, particularly in the northern parts of England, in Ireland and Holland, salted in the manner of bacon, and in this state is an article of considerable traffic. It affords a good, strong and invigorating nutriment, superior to any that we are acquainted with. *Beef-tea* is a preparation commonly made for invalids and convalescents, and consists of an infu-

sion of the lean parts of a buttock of beef in boiling water. *Veal*, or the flesh of calves, is an highly esteemed and delicate food.

The *skins* of cattle, after having undergone the processes of tanning and currying, are employed for making harness, saddles, bridles, the soles of shoes, and for various other purposes. *Calves' skins* are used for the upper leathers of shoes, by saddlers, bookbinders, &c. The skins of sucking calves are manufactured into *vellum*, a thin substance employed by book-binders; for writing and drawing upon, and for other uses. From the parings and other offals of the hides of oxen, and the parings and scraps of the legs, by boiling them in water to the consistence of a jelly, straining them through a wicker basket, suffering the impurities to subside, and then boiling them a second time, is made *glue*. This in a state of jelly is poured into flat frames or moulds; when congealed it is cut into square pieces, and afterwards dried by being suspended in a coarse kind of netting.

The leg-*bones* of oxen, after having been whitened by boiling with quicklime, are used in the manufacture of the handles of knives and forks, and for innumerable other purposes. This substance when good is nearly allied to ivory, but is easily distinguished by its porous nature, its coarse grain, and its wanting the beautiful white veins which are so conspicuous in ivory. Bones after having been burnt or calcined are used by the refiners of gold and silver.

The *horns* of oxen are used for many of the same purposes as bone. After having been softened by heat they are capable of being moulded into almost any shape. They are sometimes stained in such manner as to imitate tortoise shell, and are then used for the making of combs. By a peculiar process they are rendered semitransparent, and when formed into thin plates, are employed instead of glass for lanthorns. Horn was the first transparent matter that was ever used for lanthorns and windows.

Tallow is the fat of sheep and oxen cleared of its fibrous parts by straining and other management. It is further improved and clarified by the addition of alum, and in this state it is used for the making of candles. Tallow is also a chief ingredient in soap. From the feet of oxen is procured a kind of oil, called *neat's foot-oil*, which is of great use in the preparing and softening of leather. The *blood* is employed in clarifying sugar, and great quantities of it during the late war were exported from London to Sweden for this purpose. The skins of the intestine are used for beating gold-leaf betwixt; and these, under the name of *gold-beaters' skin*, are afterwards considered efficacious as plaster for healing small wounds. Of gold-beaters' skin the French manufacturers of toys sometimes construct little balloons for the amusement of children. A few years ago there was in London an exhibition of animals formed of this substance and inflated with air.

British cattle are considered preferable to the cattle of any other country in the world. Those called *Devonshire cattle*, which are distinguished by their mahogany colour and light yellow horns are adjudged to be the best of any. They are much used in agricultural labours, being peculiarly fitted for draught both by their hardiness and activity. The beef of this breed is peculiarly excellent. Their skins are thin, but improve much in tanning; and the tallow is of peculiarly good quality.

In the northern parts of England there is a very useful kind, called *Holderness*, or *Dutch cattle*. These in size and weight exceed all the British cattle. The cows have great celebrity for yielding a very extraordinary quantity of milk; instances have been mentioned of their yielding thirty-six quarts in a day. This stock is well known in the neighbourhood of London, being that which is generally kept by the London cow-keepers. The animal exhibited in London in the beginning of 1802, under the name of the "wonderful ox," was a variety produced from this breed, and weighed more than 200 stone.

The *Lancashire* or *long-horned cattle* are much esteemed for the dairy; the cows yielding from sixteen to twenty-four quarts of milk per day, and, on an average, about 300 weight of cheese per annum. They are hardy animals, readily become fat, and produce remarkably well-flavoured beef. But they are chiefly celebrated for the thickness and substance of their hides, which are very valuable and sell at high prices. In many instances the hides have been known to produce a greater price per pound than the beef.

Alderney cattle are a very favourite breed, that have long been known and

esteemed in the southern parts of England for their milk, which is richer than that of any other breed. These animals are of small size, the cows seldom exceeding the height of four feet, yet they are known to produce so much milk as to yield from 200 to more than 300 pounds' weight of butter per annum. In the islands of Guernsey, Jersey, and Alderney, where these cattle are chiefly bred, they are sometimes employed in ploughing; but their greatest use is in carting, and in this respect they are found to answer peculiarly well in bad roads and hilly countries. Their beef is generally yellow or very high coloured; but it is peculiarly fine in the grain, and of excellent flavour.

Scotland is famous for a small kind of black cattle, with fine white upright horns tipped with black, called *Highland stots*, or *Kyloe cattle*. Having great celebrity for the fineness and sweetness of their beef, as well as the facility with which they are fattened, they are in such esteem as to be driven into the southern counties of England, and occasionally to supply even the London markets. The cows, in proportion to their size, yield a great quantity of very rich milk.

The Yak, or Grunting Ox (*Bos grunniens*) is an animal of large size, with round, upright, and slender horns, a lump on the shoulders, long and pendant hair, white on the back and tail; and the tail somewhat resembling that of a horse.

In a wild state this animal is an inhabitant of the mountains of Thibet.

With the oriental princes the white *tail* of the yak is an object of great value for making military standards, the use of which is very ancient. These tails are also employed in many parts of the East, to ornament the trappings both of elephants and horses: and, when mounted on a silver handle, are used by the principal men of India as a brush to chase away flies. The Chinese dye the hair of a red colour, and form tufts for their caps of it. Many beautiful kinds of stuffs are woven of a fine wool which these animals have next to their skin.

The Musk Ox (*Bos moschatus*) is a North American animal of small size, with horns broad and approaching each other at the base, bent downward, and the tips upward and pointed; a protuberance on the shoulder, and the body covered with long silky hair of a dusky red tinge.

To the North American Indians the musk ox is an animal of considerable importance. Its *flesh* furnishes them with an useful food, which though it has a musky flavour is not on that account the less esteemed. This flesh, in a frozen state, is also an article of traffic with the British and American forts during the winter.

At the roots of the long hair of the musk ox there is a peculiarly beautiful ash-coloured *fleece*, which is finer and softer than silk, and may be wrought into very elegant articles of dress. It is of the long *hair* of these animals that the Esquimaux Indians make those caps which give them their very extraordinary appearance, by the ends being contrived so as to fall down over their face, as to protect them from the bites of the mosquitoes. The *skins* are convertible into leather, and are also frequently used by the Indians with the hair on, as coverings of various kinds.

Bullocks are most advantageously fattened by stall-feeding; a method now brought to systematic perfection.

The following is the result of experience, inserted in the eleventh volume of the "*Annals of Agriculture*," as communicated by J. H. Campbell, Esq of Charlton, in England, who is one of the most judicious and successful graziers in that kingdom. He first remarks, that the quantity of food required to fatten an animal, depends entirely on the *thriving disposition*, and not in the least on his weight; and then gives the following answers to Mr. Young's queries: 1. One hundred bushels of potatoes, and seven hundred weight of hay, are generally sufficient to fatten any ox that is a tolerable good thriver. 2. Small quantities of potatoes should be given at first; then increase to one or two bushels per day, but always intermixing the dry food, and regulating the quantity of hay, by the effect which potatoes produce on the bowels. There ought to be at least five servings in a day, and according to the quantity an ox can be induced to be eat with appetite, he will the sooner become fat, consequently the cheaper, and with more profit. The roots need not be cut, except in the beginning, to entice the animal to eat them; but they should always be fresh and clean. 3. There is no corn or meal necessary, unless it can be had at a moderate price; in which case it would tend to expedite, and consequently to render more profitable the whole of the feeding. Of this nature are brewer's grains, one bushel mixed with a peck

of pollard, sometimes pea or bean-meal coarsely ground, given in two divided portions. 4. Cleanliness is a principal requisite in the feeding of cattle: hence not only the mangers, but also the stalls, ought to be kept as clean as possible; and the former should be cleared from dirt and dust, with a blunt-pointed trowel, every morning. After cleansing their stalls, a sufficient quantity of fresh litter should be strewed over, which will invite them to lie down.—Mr. CAMPBELL is of opinion, and we fully agree with him, that rest contributes to fatten cattle much sooner; and likewise that combing and carding their hides, every day, promotes their thriving more than equal to the small portion of time thus consumed. Lastly, he found the greatest difficulty in prevailing upon the people, to whose care the bullocks were committed, to follow strictly his directions, and to abolish the practice of giving them too great portions of food at a time Thus, the animal frequently becomes disgusted, his appetite is impaired, and the food is wasted. The hay is to be cut once, or, if not very weighty, twice along, and three times across the truss, so as to be in squares of eight or ten inches: in this state the cattle eat and digest it more readily, while the fattening is considerably expedited

BULL, among ecclesiastics, a written letter, or public instrument, issued by order of the Pope from the Roman chancery, and sealed with lead; which seal is, properly speaking, the *bull* itself. It is impressed on one side with the heads of St. Peter and St. Paul, and on the other with the name of the pope, and the year of his pontificate.

BULLION, gold or silver, uncoined, and in the mass When these metals are in their purity, they are so soft and flexible, that they cannot well be brought into any fashion for use, without being first reduced and hardened with an alloy of some baser metal. To prevent the abuses that might be committed in making such alloys, European legislatures have generally established the quantity of alloy to be used, and thus fixed a standard-fineness within their several jurisdictions. According to the law of England, wrought plate in general is to be made to the legal standard; and the price of our standard gold and silver is the common rule whereby to set a value on bullion, whether the same be ingots, bars, dust, or foreign specie: whence it is easy to conceive that the value of bullion cannot be exactly known without being first assayed, that the exact quantity of fine metal therein contained may be determined.—Silver and gold, whether in coin or bullion, though used as a common measure for other things, are no less commodities than sugars, hemp, or cloth.

BUNT, of a sail, the middle part of it, formed designedly into a bag or cavity, that the sail may gather and hold the wind. It is used mostly in topsails. Bunt-lines are the small ropes made fast to the bottom of the sails.

BUOY, in sea affairs, a sort of close cask, or block of wood, fastened by a rope to the anchor, and which, floating on the surface of the water, points out its situation.

BURBOT, (*Gadus cota*,) is a somewhat eel-shaped species of cod with two dorsal fins, a single fleshy beard, on the nnder jaw, the jaws nearly equal in length, and the tail rounded.

This fish is found in some rivers of England, and in rivers and lakes of the continent of Europe; and when full grown weighs two or three pounds.

Although the burbot is esteemed a a very delicate fish for the table, it is so common in the Oder, and in some other rivers of Germany, that the fishermen, unable otherwise to dispose of all they catch, not unfrequently cut the fattest parts of the fish into slips, and, afterwards drying them, burn them instead of candles. The *livers* are large and of peculiarly excellent flavour. It is related of a Comtesse de Beuchlingen, in Thuringia, that she was so partial to these livers as to expend a great portion of her income in the purchase of them. If suspended in a glass and placed near a hot stove, or in the heat of the sun, they yield an oil which was formerly in great repute as an external application for the removal of swellings The *air-bladders*, which are so large as often to be nearly one-third of the whole length of the fish, are employed in some countries for making isinglass.

BURGLARY, the offence of breaking by night into a mansion house, with intent to commit a felony. In this definition, there are four things to be considered: the *time*, the *place*, the *manner*, and the *intent*. 1. The *time* must be *night*, and herein the spirit of the distinction is, that it be that time called the *dead of the night*, in which mankind in general are in a defenceless state. 2. The *place* must be a mansion-house, that is a dwelling house, or some build

ing adjoining a dwelling house, because the idea of inviolable security is exclusively attached to the place in which a man resides, and because it is only there that peculiar alarm or danger can attend a midnight attack; a barn or other distant building being, in general, as much without the protection of the owner by day as by night. 3. The *manner* must be both a breaking and an entry. It must be a breaking, because if a person leaves his doors or windows open, it is his own folly and negligence; but to come down a chimney is held a burglarious entry, since that aperture is as much closed as the nature of things will permit. To gain an entry by artifice is also burglarious. 4. The *intent* to commit a felony must be shown; otherwise, all the rest is only a trespass Burglary is a felony at common law, but within benefit of clergy.

BURGOO, a kind of porridge, is a nutritive dish, eaten by mariners, and much used in Scotland: it is made by gradually adding oat-meal to boiling water, stirring it constantly, so that the whole may mix smoothly; after which a little salt and butter should be added. COCKBURN considers it very proper for correcting that unwholesome disposition to costiveness, so frequent to persons of a sea-faring life.

BURIAL, the interment of a deceased person.

Premature Burial, a complaint which, in modern times, has excited the attention of many judicious inquirers, and become lately the subject of public investigation, in several states of Europe. It is a well attested truth, that many unfortunate persons are consigned to the grave, before they are actually dead; and that individuals, subject to epilepsy and apoplectic fits, have often been too easily buried, or more properly speaking, *smothered* in their coffins. To prevent such fatal accidents, houses for the reception of dead bodies have, within these last ten years, been erected in various cities of Germany, where every inhabitant has a right to deposit the body of a deceased person till putrefaction has actually commenced. We forbear to expatiate on the propriety and utility of a measure, which can be censured only by obstinate and superstitious Jews, who, from an old religious injunction, are enjoined to bury their departed friends on the day of their decease, and before sun-set.

With respect to the method of ascertaining the probable causes, and most evident symptoms, of *actual dissolution*, we refer the reader to the article "Apparent DEATH;" and shall here only observe, that the *first* stage of putrescency may be distinguished by the oily nature of the humours exuding through the pores, and forming a perceptible clamminess on the surface of the body. The exhaling vapour is accompanied with a faintish or slightly cadaverous odour, which marks with precision the point of time for interment. In the *second* stage, the emanating vapour is sensibly alkalescent, with a strongly putrid and offensive smell, which may alone prove noxious to the attendants. On the contrary, in cases of cancer and mortification, the putrid effluvia proceeding from vital heat and motion, ceases after death, or as soon as the body becomes cold, hence the two cases are so distinct that they cannot be easily mistaken.

BURNET, the GREAT, or Wild, or Meadow Burnet; the *Sanguisorba officinalis*, L. a native plant growing on moist pastures, especially on a marly and calcareous soil. It is a hard, woody plant, and grows from two to three feet high, branching towards the top, and terminated by thick and oval spikes of flowers, of a greyish brown colour, which appear in June and July.

This vegetable ought not to be confounded with the following, or the Upland Burnet, which is a very different genus of plants. The Great, or Wild Burnet, has been usefully employed in the art of dyeing. VOGLER dyed wool, silk, linen or cotton, in a decoction of the dried, brown-red flowers, of a grey colour with a greenish shade, by the addition of alum; of a dark lilac, which soon assumed a beautiful grey, by adding a solution of tin; and of a deep black colour, on dropping into the liquor a solution of copperas.

According to BECHSTEIN, the whole of the wild burnet is used in tanning leather, as a substitute for oak-bark: and the plant is also relished by cattle, especially by sheep.

BURNET, the UPLAND, or *Poterium sanguisorba*, L. is likewise a native plant, and by some called the Common Garden Burnet, though it grows wild in a dry calcareous soil. [Some theorists have recommended it for cultivation as a grass, but I agree with ARTHUR YOUNG, that it is little better than a weed, much inferior to grasses commonly cultivated.—T. C.]

BURNET-SAXIFRAGE. See ANISE.

BURNING, the action of fire on fuel, the minute parts of which are thereby put into violent commotion, so that some of these particles assume the nature of fire, and escape, while the remainder is either dissipated in the form of vapour, or reduced to ashes There are many instances on record, of persons who have been burnt to death by fires kindled in their own bodies: but such individuals generally had long indulged to excess in spirituous liquors.

BURNING, in surgery, denotes the application of the actual cautery, or a red hot instrument, to the parts affected. In the Mogul empire, the natives cure, or pretend to cure the colic, by applying a ring, red hot, to the patient's navel; and among the Japanese, the practice of burning constitutes nearly the whole of the healing art. It is, however, certain, that several very extraordinary cures have been performed by burning; and the ancients frequently had recourse to this remedy, with singular advantage.

BURNING OF LAND, or *Burn-baiting*, a practice long employed in agriculture, but now nearly abandoned. It is performed by cutting off the turf of the ground, piling it in heaps to dry, and afterwards burning it to ashes, which are spread over the bare surface and ploughed in. Many consider it as a very profitable method of dressing, for it need only be used on the poorest, and worst kind of lands, or barren, rushy, and heathy grounds, that have long been untilled. By this useful practice, an excellent crop may be obtained from the most impoverished soil; though the effect does not continue longer than three years, when the ground becomes as poor as it was before

BURNISHING, the art of polishing a metallic body, by a brisk rubbing of it with a burnisher, generally a round polished piece of steel. Book-binders burnish the edges of their books by rubbing them with a dog's tooth.

BURNS and SCALDS. Apply oil of turpentine frequently and cover them from the air with carded cotton: or apply hogs lard or soft pomatum mixed up with white lead. Or take of camphorated spirit two drachms, Goulard's extract one drachm, and a pint of water. The mixture to be made in the order in which they are set down, otherwise the camphor will separate. The application to be renewed till the pain and inflammation subside: the wound may then be dressed with white cerate.

The following directions are recommended in cases of the burning of females, by their clothes having caught fire. If no person is present to assist her, she may relieve herself by throwing her clothes over her head, and laying down and rolling upon them. She must by no means run away, and flame always tending upwards, much of the mischief will be prevented if a person in the unfortunate situation will throw herself on the ground, and if possible roll about her a carpet, hearth rug, &c. If another person be present, then, without any regard to delicacy, such person should instantly pass the hand under all the clothes to the lowest garment, and raise the whole together, and close them over the head, by which, in an instant almost, the flame will be indubitably extinguished. This is the most expeditious and effectual method of preventing the dire effects of a terrible accident which is perpetually occurring.

[Or, roll the person in the carpet. This is one of the many accidents owing to the preposterous customs of open fire places, and muslin dresses in winter.—T. C]

BURYING-GROUNDS are places consecrated to the interment of dead bodies; and have, from the earliest institutions of society, been held in great veneration, both by Heathens and Christians.

In the city of Amsterdam, and it is believed, in all Holland, no person may be buried without an order being previously obtained from the "high officer." This order is given without fee, for all burials which are to take place at or before 12 o'clock in the day: after which a price is paid, which increases one ducat for every hour after twelve The consequence is, that scarcely any will permit their relations to be buried until after dark, and by torch-light—The more expense, the more honour.

This principle of obtaining a revenue by taxing the folly and pride of mankind, shews the profound wisdom with which the Dutch regulate even the small est concerns: and affords an excellent example to the rest of the world.

BUSHEL, a measure of capacity for dry substances, such as grain, pulse, fruit, &c. It contains, in general, four pecks, or eight gallons, being the eighth part of a quarter.

According to the earliest excise-laws, a *London bushel* is to contain *eight* wine gallons of wheat; the gallon, *eight*

pounds of wheat (TROY-WEIGHT, which see;) the pound, *twelve* ounces; the ounce, *twenty* penny-weights; and each penny-weight, *thirty-two* grains, or corns of wheat taken from the middle of the ear. "But as such grains are of very different weight in different ears, nay, in the same ear, and even in the same field, the uncertainty of this calculation must be obvious. Nevertheless, this *standard* bushel is kept in the Exchequer: when filled with common spring-water, and measured before the House of Commons in 1696, it was found to contain 2145.6 solid inches; and the same water being weighed, amounted to 1131 ounces, and 14 penny-weights, troy. The first malt-act, however, altered these proportions, as it was then enacted, that the legal *Winchester bushel* should be 18½ inches diameter, and eight inches deep. The coal-bushel was regulated at 19½ inches wide: thus, says Mr. RENARDSON, in the 491st number of the "*Philosophical Transactions,*" two measures, both differing from the original one, were legally established; and from time to time innovations were made, till it became difficult to determine, what was meant by the name of any measure. Beside this inconvenience, the bushel has, in different counties and places, and without any apparent cause for such diversity, been made of different dimensions: at Abingdon and Andover, a bushel contains nine gallons; at Appleby and Penrith, a bushel of peas, rye, and wheat, holds 16 gallons; of barley, big, malt, mixt malt, and oats, 20 gallons. A bushel contains, at Carlisle, 24 gallons; at Chester, a bushel of wheat, rye, &c. is 32 gallons; and of oats, 40; at Dorchester, a bushel of malt and oats, is 10 gallons; at Falmouth, the bushel of stricken coals is 16 gallons; of other articles, 20, and usually 21 gallons; at Kingston-upon-Thames, the bushel contains 8½, at Newbury, 9; at Wycomb and Reading, 8¾; and at Stamford, 16 gallons.

In ascertaining the accurate weight of a bushel of corn, there is a considerable difference arrising both from the nature of the grain, and its relative perfection: thus, a bushel of oats weighs only about 40 pounds; of peas and beans, about 60; and the best wheat should weigh from 62 to 64 lbs. With greater accuracy, however, may be calculated the cubic, or solid capacity of vessels; so that a bushel containing 2145 inches, will be nearly equal to one foot and a quarter cubic measure: consequently a body of a cart, comprising 40 feet, will hold about 32 bushels, stricken measure. If a calculation be made as to the number of perfect grains of wheat, which ought to be in one standard bushel, it will be found that the net amount is 491,520 grains, or 7680 to one pint, or pound.

Some standard ought to be fixed for the bushel in Philadelphia. A friend lately found that the quantity of grain measured in three stamped half bushels, differed in weight to the amount of two pounds. [The legal standard of Pennsylvania, as settled by decisions, is the Winchester bushel of 18½ inches over, and eight inches deep, containing 2150 2-fifths, cubic inches.—T C.]

BUSS, a small sea vessel, used in the herring fishery, about 50 tons burden: it has two cabins, one at the prow and the other at the stern, the former serves for a kitchen.

BUST, or BUSTO, in sculpture, denotes the figure or portrait of a person in relievo, showing only the head, shoulders, and stomach, the arms being lopped off. The stomach and shoulders are, strictly speaking, the bust. The term is also used, by the Italians, for the *torso* or trunk of the body, from the neck to the hips The bust is the same with what the Latins called *herma* from the Greek *hermes*, Mercury, the image of that god being frequently represented in that manner by the Athenians.

BUSTARD, or *Otis tarda*, in ornithology, is said to be the largest of the British land-fowl; its breadth, with expanded wings, being nine feet; the length nearly four; and the male weighing from 25 to 27 pounds The female is about half the size of the male, and marked with different shades of colour.

Bustards inhabit most of the open countries lying to the south and east parts of this island, from Dorsetshire, as far as the Wolds of Yorkshire. In autumn, they are (in Wiltshire) generally found in large turnip-fields, near the Downs, and in flights of fifty or more. They are exceedingly shy, and difficult to be shot; run very fast, and fly, though slowly, many miles without resting: and, as they take flight with difficulty, they are sometimes run down by greyhounds. Corn and other vegetables are their usual food; but they are very fond of those large earthworms which appear in great numbers on the Downs, in the summer-mornings, before sun-rise. These are replete

with moisture, answer the purpose of liquid food, and enable them to live long without drinking. Nature has provided the males with an admirable magazine for their security against drought; being a pouch, the entrance of which lies immediately under the tongue, and is capable of holding near seven quarts; this they probably fill with water, to supply the females when sitting, or the young before they are fledged. Bustards lay only two eggs, resembling those of a goose, of a pale olive brown, marked with spots of a dark colour; they build no nests, but only scrape a hole in the ground.

BUTCHER, a person who slaughters cattle for the use of the table; cuts up and retails meat.

[A butcher is indictable for exposing to sale unwholesome provision.—T. C.]

The English legislature has affixed such an imputation of proneness to shed human blood, upon persons who slaughter brute creatures for subsistence, that, by the laws of England, no butcher is permitted to serve on a jury when sitting on the life of a fellow-subject.

BUTMENTS, supporters or props on or against which the feet of arches rest.

BUTTER, an artificial preparation of cow's milk; which, either in its entire state, or in that of cream, is agitated for a considerable time, till all its unctuous particles are separated from the whey, and a soft consistent mass is formed.

As butter is, at present, used as daily food, chiefly on account of its agreeable taste, we shall first speak of its physical properties. To render it less hurtful, it ought to be perfectly fresh, and free from rancidity; which it easily acquires, if the butter-milk has not been completely separated. Fried, or burnt butter, is detrimental to health; as it is thus converted into an acrid, caustic fluid, which is apt to disorder the stomach, and excite rancid belchings. Hence, toast and butter should never be eaten by persons of delicate health.

During the hot summer-months, the milk should stand only 24 hours, and the cream be skimmed from it, either early in the morning, before the dairy becomes warm; or in the evening, after sunset. In winter, the milk may remain unskimmed for 36, or even 48 hours; the cream ought to be preserved in a deep pan, kept, during summer, in the coolest part of the dairy, or in a cool cellar where a free air is admitted. Dr. ANDERSON (whose aphorism on this subject we shall quote at the conclusion of the present article,) is of opinion, that the temperature of a dairy should, if possible, be kept between 50 and 55° of Fahrenheit; which is nearly about the average temperature of a building secured from the external air, in the manner he has proposed; and a delineation of which the reader will find under the article MILK-HOUSE.

Those, who have not an opportunity of churning every other day, should shift the cream daily into clean pans, in order to keep it cool; but they should regularly churn twice a week in hot weather, and this in the morning, before sun-rise, taking care to fix the churn in a free draught of air. Nor should this vessel be exposed to a fire so near as to heat the wood in cold seasons, as by this means the butter will acquire a strong rancid flavour.

Decisive experiments have been made, in order to ascertain whether it be more profitable to churn the whole milk, or only the cream which the milk produces; it was found that one day's milk of a particular cow, churned by itself, yielded only 12 oz of butter; and the cream of two day's milk produced 3 lb. 2 oz. Hence it appears to be more profitable to collect the cream, and churn it, than to churn the whole milk. Cream butter is, likewise, the richer of the two, though it will not keep so long sweet.

In justice to Dr. JAMES ANDERSON, who has favoured the public with an excellent Essay "*On the Management of the Dairy*," inserted in the correspondence of the *Bath and West of England Society*, we shall communicate a few of his aphorisms: 1. The first milk drawn from a cow is always thinner, and of an inferior quality to that which is afterwards obtained; and this richness increases progressively, to the very last drop that can be drawn from the udder. 2. The portion of cream rising first to the surface, is richer in quality, and greater in quantity, than what rises in the second equal space of time, and so forth: the cream continually decreasing, and growing worse than the preceding. 3. Thick milk produces a smaller proportion of cream than that which is thinner, though the cream of the former is of a richer quality. If, therefore, the thick milk be diluted with water, it will afford more cream

than it would have done in its pure state; but its quality will at the same time be inferior. 4. Milk carried about in pails, or other vessels, agitated, and partly cooled, before it be poured into the milk-pans, never throws up such a good and plentiful cream as if it had been put into proper vessels immediately after it came from the cow.

From these fundamental facts, says Dr. ANDERSON, respecting the dairy, many very important corollaries, serving to direct the practice, may be adduced; among which we shall only take notice of the following:

First. It is evidently of much importance, that the cows should be always milked as near the dairy as possible, to prevent the necessity of carrying and cooling the milk before it be put into the dishes; and as cows are much hurt by far driving, it must be a great advantage, in a dairy farm, to have the principal grassfields as near the dairy or homestead as possible. In this point of view also, the practice of feeding cows in the house rather than turning them out to pasture in the field, must appear to be obviously beneficial

Second. The practice of putting the milk of all the cows of a large dairy into one vessel as it is milked, there to remain till the whole milking be finished, before any part is put into the milk-pans, seems to be highly injudicious, not only on account of the loss sustained by the agitation and cooling; but also, and more especially, because it prevents the owner of the dairy from distinguishing the good from the bad cow's milk, so as to enlighten his judgment respecting the profit that he may derive from each. Without this precaution he may have the whole produce of his dairy greatly debased by the milk of one bad cow, for years together, without being able to discover it. A better practice therefore would be, to have the milk drawn from each cow separately, put into the creaming-pans as soon as milked, without being ever mixed with any other: and if these pans were all made of such a size as to be able to contain the whole of one cow's milk, each in a separate pan, so that the careful *dai* (an excellent provincial word denoting the person who has the chief concern in a dairy) would thus be able to remark, without any trouble, the quantity of milk afforded by each cow every day, as well as the peculiar qualities of the cow's milk. And if the same cow's milk were always to be placed on the same part of the shelf, having the cow's name written beneath, there never could be the smallest difficulty in ascertaining which of the cows it would be the owner's interest to dispose of, and which he ought to keep and breed from.

Third If it be intended to make butter of a *very fine quality*, it will be advisable, not only to reject entirely the milk of all those cows which yield cream of a bad quality; but also, in every case, to keep the milk that is first drawn from the cow at each milking, entirely separated from that which is got last; as it is obvious, if this be not done, the quality of the butter must be greatly debased, without much augmenting its quantity. It is also obvious, that the quality of the butter will be improved in proportion to the smallness of the quantity of the last drawn milk which is used, as it increases in richness to the very last drop that can be drawn from the udder at that time; so that those who wish to be singularly nice, keep for their best butter a *very small* proportion only of the last drawn milk.

It is a matter of some importance, to determine in what way the inferior milk, which is thus set apart, when *fine* butter is wanted, can be employed with the greatest profit. In the highlands of Scotland, the people have adopted a practice merely from considerations of convenience and economy, without thinking of the improvement of the butter, which answers many good purposes. As the rearing of calves is there a principal object with the farmer, every cow is allowed to suckle her calf with a portion of her milk, the remainder only being employed for the purposes of the dairy. To give the calf the proportion allotted to it regularly, it is separated from the cow, and put into a small inclosure made for the express purpose, on every farm, of confining all the calves belonging to that farm. At regular times the cows are brought to the door of this enclosure, where the young ones fail not to meet them. Each calf is then separately let out, and runs directly to its mother, where it is allowed to suck till the dairy maid judges that it has had enough; it is then separated, the legs of the mother having been previously shackled, by a very simple contrivance, to oblige her to stand still, and the dairy maid milks off what was left by the calf. They proceed in this manner till the whole of the cows are milked, and thus do they obtain a small quantity of milk, it is

true, but that of an exceedingly rich quality; which, in the hands of such as know how to manage it, is manufactured into the richest marrowy butter that can be any where met with. This richness of the highland butter has been long remarked, and has been universally ascribed to the old grass that the cows feed upon in those remote glens; but it is in fact chiefly to be attributed to the practice here described, which has long prevailed in those districts.

Other secondary uses might be found for the milk of inferior quality. It might be converted into butter of a secondary quality; or might be sold sweet, where the situation of the farm is within reach of a town; or it might be converted into cheeses, which by being made of sweet milk, if made with care and skill, might be of a fine quality.

Dr. Anderson, in the same paper, imparts the following judicious hints: The milk should be forced out of the cavities of the butter with a flat, wooden ladle, or skimming dish, provided with a short handle; and this should be dexterously performed, with as little working of the butter as possible; for if it be too much beat and turned, it will become tough and gluey, which greatly debases its quality. To beat it up by the hand, is an indelicate practice. When butter is first made, and just taken out of the butter-milk, get out of it as much of the butter-milk as you can; then spread it thin over a marble-stone, or plate of clean iron, and soak up the remaining moisture by patting it with dry towels. This will tend to keep it sweet longer than otherwise.

After the butter has been beaten up and cleared from the milk, it is ready for being salted. The vessels intended for this purpose, being rendered perfectly clean, should be rubbed in the whole inside with common salt; and a little melted butter should be poured into the cavity, between the bottom and the sides: thus prepared, they are fit to receive the butter.

The following method of preparing butter is advantageously practised in Holland. When the cows are milked, the fluid is poured into pans, till it becomes perfectly cold; it is then stirred two or three times in the day, so that the cream and milk may more intimately combine, and if it be agitated till a spoon will nearly stand upright, the butter thus obtained is held in high esteem. As soon as the milk acquires a proper consistence, it is poured into a churn, worked for an hour, and when the butter begins to form, one or two pints of cold water are added, in proportion to the capacity of the vessel; with a view to separate the milk with greater facility.

After the butter is taken out of the churn, it is repeatedly washed and kneaded, in pure water, till the last affusion be clear and free from milk. In this simple manner, a large portion of butter is gained from an equal proportion of milk, and which is not only more firm and sweet, but also remains fresh for a longer time than that usually made in England, while the butter-milk is more palatable.

Dr. Anderson observes, that wooden vessels are most proper for containing salted butter. They should be made of cooper work, and joined with *wooden* hoops. It will be advisable to make them strong where they are to be returned to the dairy; for as it is a matter of considerable difficulty to season new vessels so well, as that they shall not affect the taste of the butter, it is always advisable to employ the old sound vessels rather than make [illegible]. Iron hoops should be rejected; as the the rust from them will in time sink through the wood, though it be very thick, and injure the colour of the butter: one iron hoop may be put at the top, and another below, and beyond the bottom; the projection below the bottom being made deep for the purpose.

An old vessel may be prepared for again receiving butter by the ordinary process of scalding, rinsing, and drying; but to season a new vessel requires greater care. This is to be done by filling it frequently with scalding water, allowing it to remain till it slowly cools. A considerable time is required before they can be rendered fit for use. [Wash them with hot water and wood ashes.—T. C.]

Although common salt is generally employed for preserving butter, yet Dr. Anderson has found by experience, that the following composition not only preserves the butter more effectually from any taint of rancidity, but makes it also look better, taste sweeter, richer, and more marrowy, than if it had been cured with common salt alone. Best common salt, two parts; saltpetre, one part; sugar, one part; beat them up together, so that they may be completely blended. To every pound, or sixteen ounces of butter, add one ounce

of this composition. Mix it well in the mass, and close it up for use. Butter prepared in this manner, will keep good for three years, and cannot be distinguished from that recently salted. It should, however, be remarked, that butter thus cured, does not taste well till it has stood a fortnight, or three weeks. In the opinion of Dr. ANDERSON, such butter would keep sweet during the longest voyage, if it were so stowed, that it would not melt by the heat of the climate, and occasion the salt to separate from it. Hence the butter ought to be previously freed from its mucilage, which is more putrescible than the oily parts. In order to prepare it for a distant voyage, let it be put into a vessel of a proper shape, which should be immersed into another, containing water. Let this be gradually heated, till the butter be thoroughly melted, in which state it may remain for some time, and then be allowed to settle. Thus, the mucilaginous part will fall entirely to the bottom, and the pure oil will swim uppermost, perfectly transparent, while hot; but, on cooling, it becomes opaque, [illegible] colour somewhat paler than the original butter, before it was melted, and acquires a firmer consistence; by which it is better enabled to resist the heat of tropical climates. When this refined butter is become somewhat firm, yet soft enough to be handled, the pure part should be separated from the dregs, then salted, and packed in the usual manner.

There is another, still more curious way of preserving this refined butter, stated by Dr. ANDERSON. After it is purified, add to the butter a certain portion of firm honey, mix them well, and they will thoroughly incorporate; this mixture, which spread on bread, has a very pleasant taste, and may be given to aged persons, if they relish it, instead of marrow; and to others, as being useful for coughs and colds. The proportion of honey employed was considerable; and the Doctor remarks, that this mixture has been kept for years, without acquiring the least degree of rancidity; so that there can be no doubt that butter might thus be safely preserved during long voyages.

Besides the different modes of *curing* butter already described, it may be easily preserved in a sweet state, by melting it down in large vessels over a slow fire; care being taken to remove the scum that rises to the surface. This method being adopted by the Tartars, we have inserted it on the authority of Mr. ETON, who states, in his late interesting "*Survey of the Turkish Empire*," &c. 8vo. that he has used butter thus boiled, and then salted, as is usual in Britain; in which state it remained perfectly sweet for the space of two years. [But it has not the taste of butter.—T. C.]

Butter has been sent from Philadelphia to the W. Indies in summer, and kept well, by packing it tightly pressed in a stone jar, and pouring a strong pickle on the top, about two inches deep. The cover of the jar was secured by a cloth, and over this there was a covering of Plaster of Paris (Gypsum).

The food of cows very often affects the taste of butter. Thus, if wild garlic, charloc, or May-weed, be found in a pasture ground, cows should not be suffered to feed there before the first grass has been mown, when such pernicious plants will not again appear till the succeeding spring; but milch-cows must not partake of the hay made of those plants, as it will likewise communicate their pernicious influence.

Cows should never be suffered to drink water from stagnant pools, in which there are frogs, spawn, &c; or from common sewers, or ponds that receive the drainings of stables; all which are exceedingly improper.

To preserve Butter.—The most effectual way of keeping butter, and preventing it becoming rancid, is to beat half an ounce of the following powder into each pound, after it is brought from the market, then put it into a stone pot, cover it with strong brine, and keep it in a cool place. *The powder*—Take common salt two ounces, nitre and loaf sugar, of each one ounce; rubbed into a fine powder. This not only keeps butter sweet, but gives it a fine flavour.

To make salt Butter fresh.—Put four pounds of salt butter into a churn, with four quarts of new milk, and a small portion of arnatto; churn them together, and in about an hour, take out the butter, and treat it exactly as fresh butter, by washing it in water, and adding the customary quantity of salt.

This is a singular experiment. The butter gains about three ounces in each pound, and is, in every particular, equal to fresh butter. Firkin butter may be bought for about eight or nine pence per pound in the month of October, and, when churned over again is worth in winter about eighteen-pence. The

butter gained pays for the milk. A common earthen churn answers the same purpose as a wooden one, and may be purchased at any pot shop.

Method for taking the rankness and disagreeable taste from Irish Salt Butter.—The quantity proposed to be made use of, either for toasts or melting, must be put into a bowl filled with boiling water, and when the butter is melted, skim it quite off; by this method it is so separated from any gross particles, that it may require a small addition of salt, which may be put into the cold water that is made use of in melting butter for sauce; and though the butter is oiled by hot water, it becomes a fine cream in the boiling for sauce.

BUTTER is a name given in old books of chemistry to several metallic muriates, on account of their texture when newly prepared. Hence there are the butters of Antimony, Arsenic, Bismuth and Tin. Thus butter of antimony is a compound of antimony and oxygenised muriatic acid, and is a muriate of antimony, and so of the rest.

[BUTTEROMETER. Tubes of glass about an inch wide closed at one end, and filled with milk: let them stand upright and the cream will separate to the top, and the relative quantity of cream and butter from equal quantities of the milk of different cows may be thus easily ascertained.—T. C.]

BUTTERFLY, or *Papilio*, in zoology, a well known insect, of which there are 273 species, principally distinguished by the colour of their wings.

The beauty [illegible] elegant part of the creation, excite the admiration of every contemplative mind. Many persons, who conceive butterflies to be of a poisonous nature, are frequently under apprehension lest they should eat them with herbs and salads; but such alarm is groundless, as they are perfectly harmless, and equally eatable as snails and oysters.

Mr EDWARDS, in his "*Natural History of Birds*," gives the following curious directions for taking the figure of these insects: Take butterflies, or field-moths, clip off the wings close to their bodies, and lay them on clean paper, in the form of the insect when flying; then have ready prepared gum-arabic, which has been some time dissolved in water, and is of a thick consistence; then pour a drop of ox gall into a spoonful of this liquid, mix it well together, and spread a little of it on a piece of thin, white paper, wide enough to take both sides of the fly; when it begins to feel clammy, the paper is in proper order to take the down from its wings; lay the gummed side on the wings, and it will adhere so as to take them up; then double the paper, so as to have all the wings between it; lay it on a table, pressing it close with the fingers, or it may be rubbed gently with something hard and smooth; after which, on opening the paper the wings will come forth transparent; the down of the upper and under sides adhering to the gummed paper, forms an accurate likeness of both sides of the wings in their natural shape and colour.

When the gummed papers have been opened, the bodies of the flies should be copied from the natural ones, upon stiff, and separate paper, painted in water colours, and fixed between the representations of the wings.

As the larvæ or grubs, and chrysalids, or butterflies, do extensive injury to fruit-trees, Mr. FORSYTH directs them to be carefully collected and destroyed: after which the trees must be washed with a mixture of lime and tobacco-water.

BUTTON, an article of dress, intended as a fastening, made of various materials, as mohair, silk, horsehair, metals, &c. In making buttons of mohair, silk, &c the material is previously wound on a bobbin, and the mould fixed to a board, by means of a bodkin thrust through the hole in the middle of it: this being done, the workman wraps the mohair round the mould in three, four, or six columns according to the intended pattern of the button. A button is not finished when it comes from the maker's hands. The superfluous hairs and hubs of silk must be taken off, and the button rendered beautiful and glossy before it can be sold. This is done in the following manner: a quantity of buttons are put into a kind of iron sieve, called by workmen a *singeing box;* then, a little spirit of wine being poured into a kind of shallow iron dish, and set on fire, the workman moves and shakes the singeing box briskly over the flame of the spirit, by which the redundant parts are burnt off, without damaging the buttons. The mould of *gold twist buttons* is first wrapped round in the same manner as that of common buttons. This being done the whole is covered with a thin plate of gold and silver, and then wrought over with purle and gimp.

BUTTRESS, a kind of butment, built archwise, serving to support the

sides of a building on the outside. They are used against the angles of towers, and on other occasions where the walls, unless very thick, would be liable, without this support, to be thrust out. They are also placed for a support and butment at the feet of arches turned over great halls, &c.

BUXUS, the box-tree, of which there are three species: 1. The arborescens, with oval leaves. 2. The angustifolio, with narrow leaves. 3. The suffruticosa, commonly used for bordering of flower-beds. The two first sorts, when suffered to grow in a natural manner, are deciduous shrubs of a very elegant figure. There were formerly large trees of these kinds upon Boxhill, near Dorking in Surry, in England. They are all easily cultivated. Box-wood is extremely hard and smooth, and therefore capable of being wrought with great neatness by the turner. It is used for the same reasons by engravers on wood.

BUZZARD, or the *Buteo*, a species of the *Falco*, or eagle, is the most common of the hawk-kind in England. It breeds in large woods, and lays two or three eggs, which are either perfectly white, or spotted with yellow. This bird is of a sluggish and inactive disposition, as it will remain perched upon the same bough for many hours, and is generally found in one place. It feeds on small birds, rabbits, moles, and mice; but it will also eat frogs, worms, and insects. The colour of the buzzard is various: the breast and belly of some are brown, but more frequently the former is of a yellowish white, with oblong rust-coloured spots: the back of the head, neck, and coverts of the wings, are of a deep brown, edged with a pale rust colour; the tail is barred either with black, or ash colour.

There is another species, the *æruginosus*, or moor-buzzard, with a greyish body, and yellow legs. It makes its nest in a tuft of grass or among rushes, is a fierce and voracious bird, and a great destroyer of rabbits, young ducks and other water-fowl.

BY-LAW, a law made *obiter*, or by the by, for the good of those that make it. All by-laws are to be reasonable, and for the common benefit, not the private advantage of particular persons, and must be agreeable to the public laws in being. In Scotland, these laws are called laws of *burlaw* or *bur-law*.

C.

C is the third letter, and second consonant, of the alphabet. It is pronounced like *k* before the vowels, *a*, *o*, and *u*, and like *s* before *e*, *i*, and *y*. C is formed, according to Scaliger, from the K of the Greeks by retrenching the stem or upright line; though others derive it from the caph of the Hebrews, which has in effect the same form; allowing only for this, that the Hebrews read backwards, &c. the Latins, &c. forwards. As a numeral C signifies 100.

CABBAGE, or *Brassica*, L. a genus of plants comprising sixteen species, of which the following are the principal:

1 The *campestris*, or field cabbage, which is also a native, and grows on the sea-shore near Dover. The severest winters do not injure this plant, which becomes peculiarly useful when every other species is destroyed. It is more generally known under the name of cauliflower, and its culture has been much improved in Britain, where it has become a source of national wealth [illegible] greater part of Europe being supplied thence with [illegible], and, till lately, Holland almost wholly with plants.

2. The *Napus*, or rape, or coleseed cabbage, which is indigenous, and also reared in various parts of England, especially in the Isle of Ely, for its seed, from which rape-oil is extracted; the refuse is called oil-cake, and is useful for the fattening of oxen, and other cattle. The most piercing frost affects not this hardy plant, which, in severe winters, is of no small service in feeding ewes; when, from the intenseness of the cold, the ground is so frozen that no turnips can be taken up. In the county of Norfolk, the cakes are broken to pieces and strewed on the land as manure, for which purpose it is considered particularly efficacious. The cultivated variety, though it has a stronger taste, may be eaten like the turnip.

3. The *rapa*, or turnip cabbage. This is a native of Britain, and grows principally in corn-fields [illegible] eaten either boiled, roasted, or raw, generally with the addition of pepper. The importance and value of this species, for the fattening of cattle in particular, have not been generally known or ascertained till within these few years. The soil intended for planting, ought to be manured and tilled in the same manner as for the common turnip, the necessary extent of old pasture-ground being previously breast-ploughed and burnt. The land should be dug as shallow as possible, and the ashes turned in: about midsummer, or sooner, should the weather be favourable, the planting ought to be commenced: [illegible] perches, if well stocked [illegible] plants, being sufficient to supply an acre.

Independently of [illegible] of this plant, as a fodder for cattle during the winter season, it has been much recommended as a sea-store, from the facility with which it may be preserved on ship board, and as it furnishes an agreeable and wholesome food for sailors on long voyages, at a time when every other fresh vegetable is entirely spoiled.

4 The *oleracea*, or sea-colewort, sea-cabbage, or common cabbage, is also indigenous, and grows principally on cliffs near the sea-coast. Early in the spring, this species is preferred to those that are cultivated; but, when gathered on the sea-coast, it is requisite that it be boiled in two waters, to deprive it of its saline taste. The roots may be eaten like those of the preceding species: but they are by no means so tender. All the various kinds of garden-cabbage in use at our tables, originate from this. The red cabbage is chiefly used for pickling. In some countries, the white cabbage is buried in autumn, when full grown, and is thus preserved during the whole winter. See WITHERING, p. 592. They are cut in pieces by the Germans, who, mixing them with some aromatic herbs and salt, press them closely down in a

tub, where they soon ferment, and are eaten under the name of *sauer kraut*.

Dr. DARWIN observes, that *Sea-Cale* is much esteemed for the delicacy of its taste, which is superior to most kinds of brocoli. It appears that this species of the cabbage should be sown the latter end of March, or the beginning of April, in drills, and afterwards earthed up. In autumn, it should be transplanted into high beds, one row of roots in each bed about a foot asunder; and, in winter, it should be covered up. The beds should be made in dry ground, and the produce will not be fit for the table till the third year after sowing. The year before it is cut for eating, it must be covered, in the beginning of winter, first with stable-dung, which may be prevented from pressing on it, by placing a few sticks in the form of a cone over each root; it should then be covered with long litter to the height of two or three feet. About the beginning of January it may be gathered, and the cutting continued till May, one bed being kept under another. It should be boiled, and sent up on toast like aspa-[illegible]

To these species also belong those varieties of the *Brassica*, denominated the *turnip rooted cabbage*, and the *drum-headed* cabbage. The former is generally supposed to have been brought from Lapland, and is found to be well calculated for uplands and wolds. It delights in a dry, sandy, mixed soil, which is prepared in the same manner as for turnips. The seed is usually sown in the beginning of June, and yields so abundantly, that half a pound of it, if sown on a seed bed two or three perches square, will produce plants sufficient to stock an acre. But if they run too much to stalk, care must be taken to transplant them, and thus to check their luxuriant vegetation. This plant is very hardy, and its bushy tops furnish a most excellent and abundant food for cattle during the spring. It is principally raised for feeding oxen, cows, hogs, and horses; but, if given to sheep during winter, it occasions a species of white flux, of which, however, they soon recover on a change of food; and which is seldom, if ever, attended with any dangerous consequences.

The drum-headed cabbage is usually sown on a bed towards the end of February or March; but sometimes also in August, in which case the plants are set out in November, and transplanted in July. A hardy variety, of a deep green colour with purple veins, and of the same size as the drum-head, has been produced from this cabbage, by planting it alternately with the red kind; and when the pods were completely formed, by cutting down the red and leaving the other for seed.

5. The *muralis*, or wall-cabbage, which is usually found on old walls and rubbish. This plant is a native of Britain; all its parts are considerably acrid, and have a rank, disagreeable smell: it is, therefore, never cultivated.

6. The *Alpina*, or Savoy. This is an exotic, and is chiefly propagated for winter use; being generally preferred when nipped by the frost. It is sown towards the latter end of April, and the culture of it varies but little from that pursued with respect to the common white cabbage; the only difference being, that the latter species may be set more closely together than the former; for, if planted in close places, it is subject to be almost consumed by caterpillars or other vermin.

To these species may be added the Scotch cabbage, so denominated from being more particularly cultivated in Scotland, where it constitutes a very considerable article of food for cattle. The variety introduced into England a few years since, is the green Scotch cabbage, which will grow extremely well on moor-lands, and, if cut just before the frost sets in, and hung up under cover, forms a food so peculiarly agreeable to cattle, that, when once they have tasted it, they will rarely relish any other.

There is another species of the *Brassica*, denominated the mowing cabbage (*choux a foucher*). It appears to be a native of Germany, but has been cultivated with considerable success in France, both as a pulse for mankind, being free from the bitter herbaceous taste of the other cabbages, and as a fodder equally good and abundant for cattle. This plant is reared from seed, and will admit of being cut four, five, or six times in the year it is sown: after which it is left for the winter. In the month of February it shoots forth, when its leaves may be cut again; in April it begins to grow up, and produces stalks and seed, which may be gathered in June. During the first year of its growth, this plant does not send forth any stalks; its leaves ap-

pearing to rise immediately out of the ground, from which circumstance it may be cut like grass, and dried in a similar manner for hay. It will also yield oil, as good as that of cole and poppy seed.

To produce early Cabbages—In the spring, as soon as the sprouts on the cabbage-stalks have grown to the length of a plant fit for setting, cut them out with a small slice of the stalk, about two inches long; and, if the season permit, plant them in a garden, and the usual care will produce good cabbages.

A gentleman in the vicinity of Philadelphia pursued the following plan: He sowed his seed in August, and set out the plants in autumn, letting them remain out all winter. If very cold, he covered them with straw; of 500 plants, 300 commonly lived and headed very early: the rest answered for greens.

From the earliest stage of its growth, the cabbage becomes the prey of a variety of insects, none of which is more formidable than the caterpillar. When young, its principal enemy is the *Chrysomela saltatoria*, or turnip-fly, and as it approaches nearer to maturity, the *Papilio Brassica*, or cabbage-butterfly. To expel the former, Dr. WITHERING directs the ground to be strewed with soot. He also adds, that if the plants be whipped with the green boughs of alder, [elder,] the latter will not touch them—With respect to caterpillars, it has been recommended as a certain remedy for the mischief they cause, that all the [illegible] of the ground, where it is intended to plant cabbages, be sown with hemp; and, however the vicinity may be infested with those insects, the ground enclosed will be found to be perfectly free from them; no vermin will approach it.

Mr. BORDLEY advises to plant a cabbage in the step, between two hills of corn, (maize) as the shade may be favorable to them.

[Cabbages are a very profitable article of field culture in strong land, as a food for cattle. The kind proper for this purpose, is the large Scotch cabbage.—T. C]

The highly beneficial effects experienced from pickled cabbage, on long voyages, is well known and will be more particularly mentioned under the head SEA VOYAGE.—See also SAUER KRAUT.

CABBAGE-PALM, or *Areca oleracea*, L. an exotic plant, and, perhaps the tallest, and most beautiful of vegetable productions, growing generally to the height of 170 or 200 feet. It is about seven feet in circumference, near the ground; its branches, when full grown, are 20 feet in length, and have a great number of green pennated leaves, some of which are nearly three feet long, though only an inch and a half broad. The bark of the cabbage-palm, which tapers as it ascends, is distinguished for a peculiarity, that is not to be observed in any other tree. Till it reaches within twenty-five o[illegible] feet of the extremity, it is of an ash colour, but then immediately changes to a deep sea-green, and continues so to the top, near which, what is called the *cabbage*, is found, enveloped in several thin, snow-white brittle flakes, of a taste similar to almonds, though somewhat sweeter. The *cabbage-flower* first appears like a small husky *spatha*, or sheath, and grows to the length of twenty inches, and to the breadth of about four inches. On being opened when young, a farinaceous yellow seed in embryo, resembling saw-dust, is found abundantly dispersed among its filaments, which are pickled and eaten with great relish. But if it be permitted to arrive at maturity, it bursts, and the inclosed part produces several small oval nuts, resembling coffee-berries.

The other parts of this plant are employed for various purposes, one of which deserves particularly to be noticed. On the inner side of the young foot-stalks are tender pellicles, of which, it is asserted, good paper might be manufactured. When the materials for making that article are so scarce, this substance deserves at least a fair trial, as it grows abundantly in the West Indies; and might be hence procured without much difficulty.

CABBAGE-TREE, *Corytha umbraculifera*. A tall and beautiful species of palm-tree, which grows on the sea-coast of Carolina, Georgia, and Florida. Its stem, or trunk, is erect, and rises 80 or 90 feet, embellished at top by a globe of plumed leaves, each somewhat like a large fan, and plicated in the same manner, each frond with its stipes or stem, 30 feet in length; the frond or expanded part of the leaf, 15 feet over. There are six species of the palm in Carolina and Florida, all of which have flabelli-formed leaves or fronds.

It is the central part of this vast plant at top, which stands erect, like a sharp cone or sugar-loaf, surrounded by

the expanding leaves, which is eaten, roasted or boiled, like cabbage; and consists of the young frond, rudiments of fronds, with all the succeeding appendages of the future growth, involved together, white and tender as a curd, as rich, and of the like pleasant flavour.

A well grown palm stands perfectly erect, on a shaft or column of 60 or 80 feet high, its base three feet diameter, having three or four rings and circular mouldings, three or four feet upwards; from thence upwards to the top, it diminishes [illegible] imperceptibly, forming a model of a pillar for the greatest architect, perhaps inimitable. A tree produces but one cabbage, and as soon as that is cut off, this glorious production of nature perishes. But, though the tree dies, yet it ceases not to be useful; the exterior ligneous part, of three-fourths inches in thickness, is as hard as bone, when dry, and the interior spongy consistence being rotted out, or devoured by worms, it makes excel[illegible]t trunks or conduits for draining off [illegible]er, being almost incorruptible under [illegible]ound. These shafts also split in two, [illegible] upright in the ground, make durable palisades; and we [illegible] they answered a very [illegible]outh Carolina, at the [illegible]ary war, particu[illegible]t Sullivan's Island. The ramparts fortifications being lined with trunks of the cabbage-tree, split in [illegible]gainst the wall; [illegible]heir smooth, firm, and elastic surface, together with their spongy interior, united to repel the shot of their assailants.

The stems are also used in Charleston, S. C. for the facing of wharfs, as the salt-water worm never touches them. Pieces of the spongy part of the stem afford a very good substitute for scrubbing-brushes, and are even preferred for whitening floors.

The leaves of the smaller species, afford excellent and durable thatch, for covering barns and out houses; and the younger leaves of the cabbage tree, are manufactured by the negroes, into beautiful, light, and durable hats, called Bermudian hats. The repent caudex of the saw-palmetto, being torn from the surface of the earth, cut into proper lengths, dried, and burnt to ashes, produce the greatest quantity of potash of any known vegetable. And the drupes, or large berries of this species, which are of the size and figure of dates, and as sweet, afford good and nourishing food to the Indians and hunters. They are not palatable to white people, till they become accustomed to them.

CABBALA, a mysterious kind of science, delivered by revelation to the ancient Jews, and transmitted by oral tradition to those of our times; serving for interpretation of the books both of nature and scripture.

CABLE, a thick, long three-strand rope, ordinarily of hemp, serving to hold ships firm at anchor, and to tow vessels in large rivers. In Europe, the cables are commonly made of hemp; in Africa, of long straw or rushes called bass; and in Asia, of a peculiar kind of Indian grass. The term cable is sometimes also applied to the cordage used to raise massy loads, by means of cranes, wheels, and other like engines: though, in strictness, cable is not to be applied to ropes of less than three inches circumference. Every cable, of whatever thickness it be, is composed of three strands; each strand of three twists; and eash twist of a certain number of caburns, or threads of rope yarn, more or less as the cable is to be thicker or smaller.

CADENCE, in music, the termination of an harmonical phrase; or a pause, or suspension, at the end of an air or some of its parts. Its use is very analogous to that of a point or stop in reading.

CADENCE, in reading, is a falling of the voice below the key-note at the close of every period. In reading, whether prose or verse, a certain tone is assumed, which is called the key-note, and in this tone the bulk of the words are sounded; but this note is generally lowered towards the close of every sentence.

CADMEAN-LETTERS, the ancient Greek or Ionic characters, such as they were first brought by Cadmus from Phœnicia; whence Herodotus also calls them Phœnician letters. According to some writers, Cadmus was not the inventor, nor even importer of the Greek letters, but only the modeller and reformer of them, and it was hence they acquired the appellation Cadmean or Phœnician letters; whereas before that time they had been called Pelasgian letters.

CADET, every son of a family, below the eldest. The word is adopted from the French. Cadette, a younger sister.

CADET, one who enters a marching

regiment as a private man, and receives pay accordingly, with the hope of promotion. In the East-India service a cadet receives a commission as soon as he lands; but by sending out their officers as cadets, the company saves the pay during the voyage.

CADUCEUS, the rod or sceptre of Mercury, being a rod entwisted by two serpents, and tipped with wings, borne by that deity as the ensign of his quality and office. It was used by the Romans as a symbol of peace and concord: and thus, when they meant to offer to the Carthaginians the choice of war and peace, they sent a javelin and a caduceus. It is used on medals as an emblem; the rod signifying power; the serpents, prosperity or plenty; and the wings, diligence.

CAGE, an inclosure of wire, wicker, &c. interwoven in the form of lattices, and used for the confinement of birds, or beasts. The latter were, in ancient times, brought to Rome in cages artfully formed of oak, or beech, and covered with boughs, that the creatures, deceived by the appearance of their place of confinement, might fancy themselves in a forest. In France, there are two sorts of cages, viz, high, or singing cages, and low, or dumb cages: those who expose birds to sale, are obliged to put the cocks in the former, and the hens in the latter, that persons may not be deceived by purchasing a hen for a cock.

CAISSON, denotes a kind of chest, frame, or flat bottomed boat used in laying the foundation of bridges in deep or rapid rivers. The piers of such bridges are built in caissons. The most considerable work where caissons were used was Westminster bridge.

CAJEPUT, an oil from the East Indies of a greenish colour, used as an embrocation for the rheumatism, and sometimes in the tooth-ache.

CALAMANCO, a fine sort of woollen stuff, manufactured in England and in Brabant. Some calamancoes are quite plain, others have broad stripes, adorned with flowers, and others plain stripes, &c

CALAMINE, *Lapis calaminaris*, or *Cadmia fossilis*, an oxyde of zinc. It is found principally in Derbyshire, Nottinghamshire, the Western parts of England, and Wales. This mineral constitutes an article of the *Materia Medica;* but, previously to being used, it is generally roasted, or calcined, in order to separate the sulphureous matter it is supposed to contain in its crude state; and also to render it more easily reducible into a fine powder. Thus prepared, it is employed in collyria, against defluxion of thin acrid humours from the eyes: for drying up humid, running ulcers, and for healing excoriations. Its principal use is in making brass: and it is the chief ingredient in Tutty ointment, and in Turner's cerate.

CALCINATION, in chemistry, the reducing of substances to a calx by fire: by this process, calcareous substances are reduced into quick lime; metal, into metallic oxydes, or, as they were formerly termed calces, and vegetable matters into white ashes. In metallurgic operations the term is employed to denote the process by which the ores are deprived of their water and salts, as a preliminary step towards the separation of the metal, and in this sense it may be considered as an advanced stage of roasting. The change which metallic bodies undergo in calcination is produced by the absorption of oxygen; hence the process, in this instance, is now called oxydation.

CALENDAR, or KALENDER, a distribution of time as accommodated to the uses of life; or, an almanac, or table, containing the order of days, weeks, months, feasts, &c. occurring in the course of the year: being so called from the word calendæ, which among the Romans denoted the first days of every month, and anciently was written in large characters at the head of each month. See KALENDS.

CALENDAR, *Julian Christian*, is that in which the days of the week are determined by the letters A, B, C, D, E, F, G, by means of the solar cycle; and the new and full moons, particularly the paschal full moon, with the feast of Easter: and the other moveable feasts depending upon it, by means of golden numbers, or lunar cycles, rightly disposed through the Julian year. See CHRONOLOGY, EASTER, &c.

CALENDAR, *Gregorian*, is that which, by means of epacts, rightly disposed through the several months, determines the new and full moons, with the time of Easter, and the moveable feasts depending upon it, in the Gregorian year. This differs therefore from the Julian calendar, both in the form of the year, and in as much as epacts are substituted instead of golden numbers.

CALENDAR OF FLORA. [This is a term applied to an account of the annual leafing and flowering of trees and shrubs; and as this happens earlier, in proportion as we approach the equator, it becomes an exponent of the climate.

The causes that influence vegetation, and that give a character to climate, are principally these: 1st. Proximity to the equator: 2d. Height above the surface of the earth; for as you ascend a mountain sufficiently high, you may, at the equator, reach every climate and temperature from the hottest to the region of eternal snow; at 15,000 feet above the surface: 3d. The vicinity of mountains obstructing the rays of the sun: 4th Exposure to particular currents of air from a warmer or colder region: 5th. The more or less perfect clearing and cultivation of the land, admitting the sun, and enabling the earth to become a reservoir of heat, to be gradually imparted. The period of vegetation, however, depending upon climate, is influenced by these circumstances, and also by a sixth, viz.: it is more vigorous and earlier, in a rich [illegible] moist part of the country. Of these causes, the most influential, at equal levels, is proximity to the equator.

The following is the calendar of Flora, extracted by B. STILLINGFLEET, Esq. from the Treatise of THEOPHRASTUS on Plants, and relates, of course, to the climate of Attica.—T. C.]

February 1.

Violet, *early bulbous.* H. Leucoium *vernum*, λευκοιον, F.

Wall flower. Cheiranthus *cheiri*, φλογιον, F.

Cornel tree. H. Cornus, *mas*, κρανεια, L.

Dogberry. Cornus, *sanguinea*, θηλυκρανεια, L.

February 14.

Bay tree. H. Laurus *nobilis*, δαφνη, L.

Alder. Betula *alnus*, κληθρα, L.

Abele. Populus *alba*, λευκη, L.

Elm. Ulmus *campestris*, πτελεα, L.

Sallow, *Salix*, ιτεα, L.

Poplar, *black*. Populus *nigra*, αιγειρος, L

Plane tree. H. Platanus *orientalis*, πλατανος, L

March 12.—Beginning of SPRING.*

Fig tree. H. Ficus *carica*, ερινεος, L.

Alaternus. Rhamnus *alaternus*, φιλυκη, L.

Hawthorn. Cratægus *oxyacanth.* οξυακανθος, L.

Christ's thorn. H. Rhamnus *paliurus*, παλιουρος, L.

Turpentine tree. H. Pistacia *terebin.* τερμινθος, L.

Chesnut-tree. H. Fagus *castanea*, διοσβαλανος, L.

Walnut-tree. H. Juglans *regia*, καρυα,† L.

Lily of the valley. Convallaria *Maialis*, οιvανθη, F.

Narcissus. C. B ανεμωνη λειμωνια, F.

Daffodil. H. Narcissus *pseudo-narcissus*,‡ βυλβοκωδιον, F.

Corn flag. H. Gladiolus *communis*, F.

Hyacinth. Hyacinthus *comosus*, υακινθος, F.

Rose, rosa, ροδον, F.

March 20 §

Elder tree. Sambucus *nigra*, ακτη, L

Fleawort. H. Plantago *psyllium*, κυνοψ, F.

Oak. Quercus *robur*, δρυς, L.

Fig-tree. H. Ficus *carica*, συκη, L

Oak. H. Quercus *esculus*, φηγος, L.

Lime-tree. Tilia *Europæa*, φιλυρα, L.

Maple. Acer *campestris*, ζυγια, L.

Apple-tree. Pyrus *malus*, μηλεα, L.

Ivy. Hedera *helix*, κισσος, L.

Beam tree, *white*. Cratægus *aria*, αρια, L.

* Between February 28 and March 12, the Ornithian winds blow, and Swallow appears.

† Καρυα is always attended with a description, and appears to indicate a nut-bearing tree. K. Ευβοικη. K. βασιλικη K. Περσικη, all denote the *walnut*, and illustrate its history. Καρυα Ηρακλεωτικη, Nux *avellana*, the *hazel-nut*, of which Theophrastus reckons two sorts, K. αγρια and K. ημερος. Corylus *avellana*, the *common* nut. Corylus *colurna*, the *filberd* (S.)

‡ Narcissus Bulbocodium, L. Sp. Pl. 417. (S.)

§ Between March 11 and 26, the Kite and Nightingale appear, that, is, in the leafing season. The appearance of the Hawk is consonant to what Aristotle says, but is determined upon a different kind of testimony; which is a proof that this part of the Calendar at least is tolerably well stated.

March 26.

Tree of Life. H. Thuia *occidentalis*, θυια, L.

April 4

Succory, Cichorium *intybus*, κιχοριον, F.

May 12.—Beginning of SUMMER.

May 15.

Wheat harvest.

Turpentine-tree. H. Pistacia, *terebinthus*, τερμινθος, F. R.

Flower of Constantinople. H. Lychnis *Chalcedonica*, λυχνις, F.

Rose campion. H. Lychnis *coronaria*, (Agrostemma coronaria, L.) διος ανθος, F.

Asphodel, *yellow*. H. Asphodelus *luteus*, ασφοδελος, F.

Ash-tree.* Fraxinus *excelsior*, μελια, F R

Maple. Acer *pseudo-platanus*, σφενδαμνος, F. R

Pine H Pinus† *sylvestris*, πιτυς, F.

Fir-tree, *common*. Pinus *abies*, πευκη, F.

June 20.

Fir-tree,‡ *yew leaved* Pinus *picea*, ελατη, F.

Yew-tree. Taxus *baccata*, μιλος, F. R.

Cornel-tree H. Cornus *mas*, κρανεια, F R

Midsummer shoots of the oak.

The fig, the vine, and the pomegranate, shoot later.

July 23.

Cuckow disappears.

July 30.

Etesian winds blow

August 19—Beginning of AUTUMN.

Lily, Lilium, λειριον, F.

Crocus. Crocus *autumnal*, κροκος, F.

Dogberry. Cornus *sanguinea*, θηλυκρανεια, F. R

Alder. Betula *alnus*, κληθρα, F. R

Quail. Tetrao *coturnix*, ορτυξ, *departs*.

September 20.

Crane. Ardea, *grus*, γερανος, *departs*

Autumn shoots of trees.

October 12

Oak. Quercus *robur*, δρυς, F. R.

Chesnut. H. Fagus *castanea*, διος βαλανος, F. R.

Christ's thorn. H. Rhamnus *paliur*. παλιουρος, F R.

Hawthorn. Cratægus, *oxyacantha*, οξυακανθος, F. R

Holm oak. H Quercus *coccifer*, πρινος, F. R.

Alaternus. H. Rhamnus *alatern*. φιλυρη, F. R.

October 29.

Venice sumach. H. Rhus *cotinus*, κοκκυγεια, F.

Apple-tree. Pyrus *malus*, μηλεα, F R.

Beam-tree, *white*. Cratægus *aria*, αρια, F. R.

Lime-tree. Tilia *Europæa*, φιλυρη, F R.

Box-tree. Buxus *sempervivens*, πυξος, F. R

November 15—Beginning of WINTER.

Ivy. Hedera *helix*, κιττος, F. R.

Juniper H. Juniperus *communis*, αρκευθος, F. R.

Tree of life. H. Thuia *occident*. θυια, F. R.

Yew-tree. Taxus *baccata*, μιλος, F R.

Pear-tree. Pyrus *communis*, αχρας, F. R.

Arbutus. H. ανδραχνη, F. R.

* Dr. Smith has shewn, from the papers of Dr. Sibthorp, that the μελια of Theophrastus is the Fraxinus *Ornus*, or Manna Ash, and not F. *excelsior*, or Common Ash, which is not known in Greece; and that the πευκη is probably the Pinus *maritima*.

† Πιτυς, Pinus *sylvestris*.

Πευκη αγρια, 1 Genus. Π Ιδαια, Pinus *pinaster*.

2 Genus. Π Παραλιας, Pinus *maritima*

Two wild sorts.

Πευκη ημερα, Pinus *pinea*, Stone Pine.

Πευκης τι γενος, Pinus *larix*.

Π. ελατη, 1. Αρρην. Pinus *abies*, Spruce Fir.

2. Θηλεια. Pinus *picea*, Silver Fir.

‡ Theophrastus, contrary to his usual custom, is very diffusive in his description of the Pine and Fir-trees. (S.)

[The following is a Calendar of Flora calculated by Professor MARTIN, after observations during a series of years, for the climate of London.—T. C.]

TIMES OF LEAVES.

	Foliation.	Defoliation.
Acer Pseudoplatanus. *Great Maple*, vulgarly *Sycamore*. *Plane*, Scotl.	Apr. 9, 12, 13.	Bare, Nov. 10, 1792.
Acer Campestre. *Common Maple*,	Apr. 18, 19.	Yellow, Nov. 1, and bare Dec. 10, 1792. Yellow and falling Oct. 14, 1793. Nov. 1, 1804.
Æsculus Hippocastanum, *Horse Chesnut*,	Apr. 12 to May 11.	Oct. 17, 1792. Oct. 14, 1793. Oct. 27, 1804.
Cratægus s. Mespilus Oxyacantha, *Hawthorn*, or *Whitethorn*.	Apr. 10, 12. Apr. 7, 1784. Mar. 22, 1794.	Oct. 10, 1793, begins to fall. Some almost naked, Nov 1, 1804.
Fagus Castanea, *Sweet Chesnut*,	Apr. 16, 21.	Oct. 12, 1792, turns yellow.
Fagus sylvatica, *Beech*, - -	Apr. 29. -	Rusty, Nov. 1. Coppices almost naked, Nov 6, 1792.
Fraxinus excelsior, *Ash*,	Apr. 22 to May 15.	Bare, Nov. 20, 1792. Some trees turned very yellow, Oct. 10, 1793. Old ones naked, Oct 27. 1804.
Juglans regia,	Apr. 21 to May 14.	Falling, October 27, 1804.
Morus nigra, *Mulberry*,	May 20. Budding. Apr. 24, 1794.	Oct. 17, 1792. Nov. 28, 1799, quite bare. Falling, Nov. 7, 1804.
Pinus Larix, *Larch*,	April 8	Bare, Dec. 10, 1792.
Platanus occidentalis, *Occidental Plane*,	April 21.	Oct. 14, to 27.
Populus nigra, *Black Poplar*,	Apr. 21, 22.	Bare, Nov. 20, 1792.
Populus alba, *White Poplar*,	Apr. 10, 16.	Bare, Dec 10, 1792.
Populus Italica, *Lombardy Poplar*,	May 3, 7.	Falling, October 14, 1793. Almost naked, Oct. 27, 1804.
Pyrus communis, *Pear*,	April 6.	Falling Oct. 27. Almost bare, Nov, 1, 1804.
Pyrus Malus, *Apple*, - -	April 14.	Falling, October 10, 1793.
Quercus robur, *Oak*, - - -	May 6. - -	Oct. 22, to Nov. 16.
Ribes Uvacrispa, *Gooseberry*,	Feb. 13, 1783. Mar. 13, 1784.	
Rosa rubiginosa, *Sweet Briar*,	Feb. 21, 1783.	
Rubus fruticosus, *Bramble*, -	Feb. 21, 1783, budding.	
Salix Babylonica, *Weeping Willow*,	Apr. 8. - -	Dec. 11, 1792, leaves falling.
Sambucus nigra, *Elder*,	Feb. 21, 1783.	
Tilia Europæa, *Lime*, -	Apr 18. to May 12.	Nov. 6, 1786, bare.
Ulmus campestris, *Elm*,	Apr. 10 - -	Quite bare, Nov. 3, 1788, in St. James's Park. Ditto Nov. 10, 1792.

General Remarks.

1786. Nov. 4. Oaks in full leaf, whilst Beeches have lost their foliage.

Nov. 16. All leaves fallen, except from Oaks, whose foliage is of the Midsummer shoot.

1787. Nov. 14. The Planes by the Ranger's house in the Green Park have many green leaves; whereas, on Nov. 6, leaves were entirely fallen in the country, except from elms.

1788 Oct. 22. The foliage continued unusually fresh to this day; when the leaves begin to fall in showers, in consequence of frost. Some Oaks are still green in the woods.

1792 Leaves begin to fall on Aug. 16, and were mostly fallen Oct. 18. Beeches began to change colour Sept. 3, the tinge was much deepened Oct. 4, and the trees were bare Nov. 10.

Many Lime trees about London were bare on Sept. 12; whilst, on Sept. 28, Limes 50 miles S. W. of London, whose roots penetrated into the fissures of the rocks, had their foliage unchanged.

Sept. 14. Many introduced trees, as Italian Poplars, Planes, Tulip-trees, and also the esculent Chesnut, were in full verdure, while most of our native Trees were much faded.

Nov. 27. The Elm was the only tree which retained any leaves; but they were mostly gone by the 10th of December.

1794. The Spring was remarkably forward, and vegetation exuberant. Whitethorn was in leaf, and Blackthorn in bloom, about Cambridge March the 22d

April 18. Green Gooseberries were brought to market.

April 22. Whitethorn was in full flower.

[The following tables of the leafing and flowering of certain plants 63 miles north of London, by Mr. B. Stillingfleet, will also serve to shew the variations that take place in that climate, and they are not less in ours.—T. C.]

LEAFING.

	1808.	1809.
Sambucus nigra, *Elder*	Apr. 9.	Feb. 27
Philadelphus coronarius, *Syringa*	Apr. 26.	Mar. 6.
Syringa, *Lilac*	May 1.	Mar. 12.
Salix babylonica, *Weeping Willow*	May 6.	Mar. 12.
Ribes Uva crispa, *Gooseberry*	Apr. 7.	Mar. 15.
Ribes nigrum, *Black currant*	Apr. 29.	Mar. 15.
Pinus larix, *Larch*	Apr. 30.	Mar. 17.
Berberis vulgaris, *Barberry*	Apr. 26.	Mar. 18.
Cratægus oxyacantha, *White-thorn*	Apr. 30.	Mar. 21.
Rosa canina, *Dog Rose*	Apr. 13.	Mar 21.
Ribes rubrum, *Red Currant*	Apr. 14.	Mar. 21.
Euonymus europæus, *Spindle-tree*	May 2.	Mar. 23.
Spiræa hypericifolia	May 1.	Mar. 24.
Viburnum lantana, *Wayfaring-tree*	May 2.	Mar. 24.
Pyrus malus, *Apple-tree*	May 4.	Apr. 12.
Sorbus aucuparia, *Mountain Ash*	May 6.	Apr. 15.
Populus balsamifera, *Tacamahaca*	May 6.	Apr. 15.
Æsculus hippocastanum, *Horse Chesnut*	May 3.	Apr. 20.
Pyrus communis, *Pear-tree*	May 4.	Apr. 20.
Corylus avellana, *Hazel-nut*	May 5.	Apr. 22.
Mespilus germanica, *Medlar*	May 6.	Apr. 22.
Acer pseudoplatanus, *Sycamore*	May 6.	Apr. 23.
Prunus cerasus, *Cherry*	May 4.	Apr. 24
Prunus sativa, *Plum*	May 6.	Apr. 25.
Populus dilatata, *Lombardy Poplar*	May 10.	May 6.
Betula alnus, *Alder*	May 10.	May 7.
Betula alba, *birch*	May 6.	May 7.
Cratægus aria, *White Beam tree*	May 12.	May 8.
Carpinus betulus, *Hornbeam*	May 16.	May 10.
Cornus sanguinea, *Dogwood*	May 10.	May 10.
Cratægus crus-galli, *Cock's-spur Hawthorn*	May 13.	May 11.
Fagus sylvatica, *Beech*	May 16.	May 11.
Ulmus campestris, *Elm*	May 10.	May 12

LEAFING—*continued.*

	1808.	1809.
Populus alba, *White Poplar*	May 16.	May 12.
Acer campestre, *Maple*	May 16.	May 12.
Vitis vinifera, *Vine*	May 14.	May 12.
Tilia europæa, *Lime-tree*	May 12.	May 10.
Juglans regia, *Walnut*	May 13.	May 13.
Quercus robur, *Oak*	May 16.	May 15.
Robinia Pseudacacia	May 18.	May 16.
Fraxinus excelsior	May 14.	May 16.

FLOWERING.

	1808.	1809.
Corylus avellana, Female	Feb. 3	Feb. 1.
———— Male	Feb. 5	Feb. 3.
Helleborus hyemalis, *Christmas Rose*	Feb. 5.	Feb. 2.
Galanthus nivalis, *Snowdrop*	Mar. 1.	Feb. 6.
Anemone hepatica	Mar. 1.	Feb. 11.
Crocus vernus	Mar. 4.	Feb. 17.
Taxus baccata, *Yew*, Male,	Apr. 7.	Feb. 18.
Daphne mezereum	Mar. 4.	Feb. 18.
Draba verna, *Whitlow-grass*	Apr. 2.	Feb. 18.
Primula vulgaris, *Primrose*	Feb. 29.	Feb. 23.
Viola odorata, *Sweet Violet*	Apr. 7.	Feb. 23.
Buxus sempervirens, *Box*	Apr. 13.	Mar. 7.
Amygdalus persica, *Peach and Nectarine*	Apr. 7.	Mar. 15.
Prunus armeniaca, *Apricot*	Apr. 7.	Mar. 17.
Ranunculus ficaria, *Pilewort*	Apr. 7.	Mar. 18.
Saxifraga crassifolia	Apr. 17.	Mar. 20.
Narcissus Pseudonarcissus, *Daffodil*	May 2.	Mar. 22.
Amygdalus communis, *Almond*	May 1	Mar. 25.
Vinca major, *Great Periwinkle*	May 7.	Mar. 25.
Hyacinthus orientalis, *Garden Hyacinth*	Apr. 13.	Mar. 28.
Cheiranthus cheiri, *Wallflower*	Apr. 17.	Mar. 29.
Prunus spinosa, *Blackthorn*	Apr. 30.	Mar. 30.
Ribes Rubrum	Apr. 26.	Apr. 8.
Primula officinalis, *Cowslip*	May 2.	Apr. 13.
Prunus cerasus	May 2.	Apr. 15.
Fritillaria meleagris, *Fritillary*	May 4.	Apr. 20.
Glecoma hederacea, *Ground Ivy*	May 2.	Apr 25.
Gentiana verna, *Gentianella*	May 11.	Apr. 30.
Pulmonaria virginica	May 7.	May 4.
Ribes nigrum	May 10.	May 5.
Scilla nutans, *Hare bell*	May 13.	May 5.
Veronica chamædrys, *Germander Speedwell*	May 16.	May 6.
Cardamine pratensis, *Ladies-smock*	May 13.	May 8.
Carum carui, *Caraway*	May 17.	May 9.
Tulipa gesneriana, *Tulip*	May 14.	May 9.
Prunus laurocerasus, *Laurel*	May 17.	May 10.
Pyrus malus	May 14.	May 10.
Plantago lanceolata, *Ribwort Plantain*	May 14.	May 10.
Chærophyllum sylvestre, *Cow-weed*	May 16.	May 10.
Viburnum lantana, *Wayfaring-tree*	May 16.	May 11.
Rosmarinus officinalis, *Rosemary*	May 1.	May 12.
Erysimum barbarea, *Winter Cress*	May 18.	May 12.
Spiræa hypericifolia	May 17.	May 12.
Berberis vulgaris	May 23.	May 15.
Syringa, *Lilac*	May 16.	May 15.
Pyrus cydonia, *Quince*	May 17.	May 17.
Alopecurus pratensis, *Fox-tail grass*	May 17.	May 17

Brimstone and Peacock's-eye Butterflies,	Apr. 13.	Feb. 28
Cuckoo first heard,	Apr. 30.	May 1
Swallow first seen,	May 1.	May 5

[According to Professor Bigelow, of Cambridge, Massachusetts, the peach tree in 1817, flowered at

Fort Claiborne, in north lat. 31° 50′ and long. 87° 50′ west of Greenwich, on the 4th March, 1817.

Charleston	do.	32 44	do.	80	39	from 6th to 12th March.
Richmond	do.	37 40	do.	77	50	23d, March to April 6.
Lexington, Kentucky	do.	38 6	do.	85	8	6th to 15th April.
Baltimore	do.	39 21	do.	77	48	9th April.
Philadelphia	do.	39 56	do.	75	8	15th April.
New York	do.	40 42	do.	74	9	21st to 26th April.
Boston	do.	42 23	do.	70	52	9th May.
Albany	do.	43 39	do.	73	30	12th May.
Montreal	do.	45 35	do.	73	11	12th May.
Valencia, in Spain	do.	39 29	do.	0	23	19th March, 1817.
Genoa	do.	46 12	do.	6	9	east, 1st April, 1817.

Hence, under nearly the same parallel of latitude, the peach tree flowers almost a month later in North America than in Europe; as will be seen by comparing Philadelphia with Valencia.

The Baron de Humboldt remarks, in his memoir on the Distribution of Heat on the Surface of our Globe, that the peach tree flowers every where in that month, wherein the mean heat is 5·5 of the Centigrade thermometer, equal to about 42 of Fahrenheit. This happens at

Rome, in lat.	41° 53′	at the beginning of February.
Paris,	48 50	at the beginning of March.
Upsal,	59 51	at the end of April.
Uleo,	65 —	in May.
North Cape,	71 —	at the end of June.

In those very high northern latitudes, vegetable life does not extend beyond seventy days.

The Calendar of Professor Bigelow, is so interesting for our own country, that long as it will render this article, we think it right to insert it entire.—T. C.]

Facts serving to shew the Comparative Forwardness of the Spring Season in different parts of the United States, by Jacob Bigelow, M. D. Rumford Professor and Lecturer on Materia Medica and Botany, in Harvard University.

It was suggested to me some years since by the late venerable Dr. Muhlenberg of Pennsylvania, that if a series of Calendars of vegetation should be kept for the same year in different of the United States, and the whole published collectively; the result would be valuable, by affording an actual view of the comparative forwardness of the season in the various latitudes and situations of the country. This suggestion was interesting to me, because it was evident that a course of observations taken on the same year would afford more accurate grounds for comparison, than any which might casually be made in different years, and subject to the variation of different seasons. As the plan was never executed by Dr. Muhlenberg, I determined to attempt carrying it into effect after his death.—With this view, in the autumn and winter of 1816, I wrote to correspondents in various sections of the country, requesting them to observe and note down the time of flowering in 1817 of the common fruit trees, and a few other plants which were suggested, as being probably found in most parts of the United States. In reply to these applications I received very seasonable and friendly communications from Stephen Elliott, Esq. at Charleston, S. C. Dr. Trent, at Richmond, Va.—Dr. Croghan, at Louisville, and Drs Overton and Short, at Lexington, Ky.—Dr. Revere, at Baltimore,—Zaccheus Collins, Esq. at Philadelphia,—Professor Mitchill, at New York,—Dr. Beck, at Albany,—Professor Cleaveland, at Brunswick, Me. and Mr. W. Cleghorn, at Montreal. The returns were even more numerous than I had solicited, some of the gentlemen having obligingly interested themselves to procure for me notices respecting other places than those of their own residence. I have also preserved one or two dates relating to the same subject, taken from the newspapers The notices taken at the above-mentioned places are published in order, beneath.

Charleston, S. C.

Amygdalus Persica, *Peach tree*, from March 6 to 12.

Prunus Cerasus, *Cherry tree*, March 24

Pyrus Cydonia, *Quince tree*, March 31.
Pyrus Malus, *Apple tree*, April 4.
Pyrus communis, *Pear tree*, April 4.
Sanguinaria Canadensis, *Blood root*, March 20.

RICHMOND, Va.

Amygdalus Persica, from March 23 to April 6.
Amygdalus communis, *Almond*, March 10.
Ulmus Americana, *American Elm*, March 3 to 15.
Acer rubrum, *Red maple*, March 12.
Pyrus malus, April 10—18.
Pyrus communis, April 6—10.
Prunus Cerasus, April 4.
Syringa vulgaris, *Lilac*, April 13.
Fraxinus Americana? *Ash*, May 20.

LEXINGTON, Ky.

Stellaria alsine, *Chickweed*, March 1.
Ulmus Americana, March 10.
Acer rubrum, March 10.
Sison bulbosum, Mx. March 15.
Anemone hepatica var. acuta, *Liverwort*, March 20.
Sanguinaria Canadensis, March 27.
Corydalis cucullaria, April 1.
Leontodon taraxacum, *Dandelion*, April 3.
Prunus avium, *May cherry*, April 5.
Erythronium Americanum, April 5.
Amygdalus Persica, April 6—15.
Corydalis aurea? April 7.
Æsculus echinata? MUHL. *Buck eye*, April 10.
Pyrus Malus, April 10.
Podophyllum peltatum, *May apple*, April 27—March 1.
Geranium maculatum, April 30.
Erigeron bellidifolium, April 30.
Delphinium azureum, April 30.
Cerastium longe pedunculatum et villosum, April 30.
Syringa vulgaris, April 15.
Pyrus botryapium (50 miles north) April 15.
Note. The observations at Louisville, by my friend Dr. CROGHAN, agreed very nearly with the above.

BALTIMORE.

Amygdalus Persica, April 9.
Prunus cerasus, April 8.
Pyrus Malus, April 14.
Pyrus communis, April 17.
Acer rubrum, April 7.
Ulmus Americana, April 11.
Sanguinaria Canadensis, April 4.
Sorbus ancuparia, *Mountain Ash*, May 13.
Anemone nemorosa, *Wood anemone*, May 6.
Syringa vulgaris, May 5.

PHILADELPHIA.

Pothos fœtida, March 18.
Alnus serrulata, AIT. March 24.
Anemone hepatica, April 6.
Anemone thalictroides, April 8.
Acer rubrum, April 10
Claytonia Virginica, April 10.
Erythronium Americanum, April 14.
Amygdalus Persica, April 15.
Laurus Benzoin, *Spice wood*, April 15.
Sanguinaria Canadensis, April 15.
Anemone nemorosa, April 15.
Saxifraga vernalis, April 15.
Epigæa repens, April 15.
Arabis lyrata, April 20.
Prunus cerasus, April 20.
Pyrus communis, malusque, April 20
Caltha palustris, April 22.
Houstonia cœrulea, April 22
Leontodon taraxacum, April 22.
Corydalis cucullaria, April 22.
Salix longirostris, April 22.

NEW YORK.

Acer rubrum, April 11.
Ulmus Americana, April 11.
Erythronium Americanum, April 15
Ribes rubrum et grossularia, *Currant and Gooseberry*, April 15.
Caltha palustris, April 16.
Anemone nemorosa, April 19.
Claytonia Virginica, April 20
Amygdalus Persica, April 21—26
Prunus Cerasus, April 25—30.
Sanguinaria Canadensis, April 26.
Pyrus botryapium, April 26.
Prunus domestica, *Plum tree*, May 1
Pyrus communis, May 2.
Pyrus malus, May 4.
Syringa vulgaris, May 5.

ALBANY.

Anemone hepatica, April 17.
Anemone thalictroides, April 26.
Aquilegia Canadensis, May 1.
Fragaria Virginica, *Strawberry*, May 8
Polygala paucifolia, May 11.
Geranium maculatum, May 13.
Amygdalus Persica, May 12.
Pyrus communis malusque, May 15.
Uvularia sessilifolia, May 13.
Uvularia perfoliata, May 15.

BOSTON.

Anemone hepatica, April 20.
Ulmus Americana, April 20.
Acer rubrum, April 22.
Sanguinaria Canadensis, April 29.
Saxifraga vernalis, April 29.
Andromeda calyculata, May 1.
Viola blanda et primulifolia, May 1.
Caltha palustris, May 2.
Ranunculus fascicularis, May 2.
Potentilla sarmentosa, MUHL. May 2.
Anemone nemorosa et thalictroides, May 2.

Aquilegia Canadensis, May 4.
Leontodon taraxacum, May 4.
Coptis trifolia, SALISB. May 6.
Thalictrum dioicum, May 8.
Pyrus botryapium, May 8.
Erythronium Americanum, May 9.
Amygdalus Persica, May 9.
Prunus Cerasus, May 9.
Pyrus communis, malusque, May 18.
Syringa vulgaris, May 22.
Geranium maculatum, May 22.

BRUNSWICK, Me.

Acer rubrum, April 28.
Populus tremuloides, Mx. April 28.
Ulmus Americana, May 2.
Alnus serrulata, May 3.
Anemone nemorosa, May 5.
Leontodon taraxacum, May 12.
Prunus Cerasus, May 16.
Pyrus communis, May 26.
Pyrus Malus, May 29.
Syringa vulgaris, June 8.
Sorbus aucuparia, June 11.

MONTREAL, Canada.

Sanguinaria Canadensis, May 1.
Claytonia Virginica, May 1.
Crocus vernus, May 1.
Acer rubrum, May 5.
Aquilegia Canadensis, May 5.
Ribes grossularia, May 5.
Ulmus Americana, May 10.
Trillium cernuum, May 10.
Amygdalus Persica, May 12.
Erythronium Americanum, May 14.
Caltha palustris, May 15.
Leontodon taraxacum, May 15.
Uvularia perfoliata, May 15.
Fragaria Virginica, May 15.
Tiarella cordifolia, May 24.
Prunus cerasus, May 24.
Pyrus communis, malusque, May 25.

A letter from a gentleman at Fort Claiborne, in the Alabama territory, cited in the Boston Daily Advertiser, Sept. 25, states, that the Peach trees were in blossom at that place on the 4th of March.

It will be observed, that some latitude must be allowed in the exactness of the time at which the foregoing observations were made, since most of the trees and shrubs would continue in flower for one or more weeks, at any part of which time the observations might be made. It is most probable however that notice would be taken of the earliest period at which they were generally in flower. At any rate it is not likely that the statements generally would vary more than a week from this time.

The letters from Charleston, Richmond and Lexington state the spring to have been less forward than usual, and the preceding winter unusually severe. At Boston the season was not more backward than common. I am in possession of memoranda, containing the blossoming time of the fruit trees here for the last twenty years, of which, that in 1817 presents nearly a fair average. The season of 1816 was cold and unfavorable to vegetation almost beyond a precedent, while that of 1817 has been marked by fine weather and unusual plenty.

Mr. RICH, American Consul at Valencia in Spain, informs me, that the peach trees were in blossom there about the 19th of March. I observe from the record of Mr. SALISBURY's botanical excursions this year near London, that the Apple tree flowered there May 8th.

My attempts to obtain information from some other places near the extreme boundaries of the United States, were unsuccessful. From the statements already given it may be inferred that the difference of season between the northern and southern extremities of the country is not less than two months and a half.

Difference of longitude does not seem very materially to affect the Floral Calendar within the United States.

My best thanks are due to the gentlemen who have contributed the materials for this compilation.

Boston, Dec. 1817.

P. S. A letter received while this article was in the press, from Professor DECANDOLLE, of Geneva, in Switzerland, contains the following memoranda for that place in 1817.

Anemone nemorosa, March 15.
Leontodon taraxacum, April 1.
Amygdalus Persica, April 1.
Prunus Cerasus, April 3.
Pyrus communis, April 3.
Caltha palustris, April 8.
Pyrus Malus, April 15.

[Hence it appears, that in the average, vegetation is about a month backwarder in the United States, than under the same parallels of latitude in Europe.—T. C.]

CALENDER, a machine employed in manufactories to press woollen and silken stuffs, and linens, in order to make them smooth, even, and glossy, and also to give them waves, as is done with mohairs and tabbies. This apparatus consists of two thick cylinders or rollers of very hard and well polished wood, round which the stuffs intended to be calendered, are wound.

The rollers are then placed cross-wise between two very thick boards, the lower of which serves as a fixed base, while the upper one is moveable by means of a thick screw, with a rope fastened to a spindle that forms its axis; the uppermost board is also laden with large stones of above twenty thousand pounds weight. When waves are required on the cloth, the weight gives the polish, and the waves are made by means of a shallow indenture on the roller.

In the year 1797, the *Soc. of Arts, Lond.* conferred a reward of 30 guineas on E. BUNTING for his improvement on Calender Mills. The mechanism of Mr. B's ingenious contrivance being such as cannot be described without delineation, the inquisitive reader will consult the 15th vol. of the Society's *Transactions*, where the whole is illustrated with an engraving. We shall, therefore, only add, that these improvements have received the sanction of able mechanics, who consider them as a valuable acquisition to calenderers; and who, from its cheapness and practicability, conceive them to be worthy of public attention

CALF, in zoology, the young of a cow. On account of its great utility, the means of rearing, feeding and improving this animal, have from its earliest existence, exercised all the ingenuity of mankind. There are two methods of feeding calves: the first is, to let them run about with their dam the whole of the first year; a plan which is generally acknowledged to be productive of the best cattle, and is pursued in counties where fodder is cheap. The other mode is, to take them from the dam when about a fortnight old, from which period they are "brought up," by hand"

Various plans have, with considerable success, been tried and recommended for the rearing of calves with a small allowance of milk, and in some cases without any. In several counties of England, calves, on being taken from the cows, are taught to drink lukewarm *flet*, or skimmed milk; it being dangerous to give it them too hot. The time selected for this purpose, is from the latter end of January to the beginning of May, about 12 weeks after which, for nearly a month, they are fed with milk diluted with water. Small wisps of hay are then placed round them on cleft sticks, in order to induce them to eat. About the latter end of may, they are turned out to grass, being only taken in a few times at first, during the night, when they have milk and water given them; which is also continued, though in less proportion, during the last month, till they are able to feed themselves, and consequently disregard it. Care is also taken to wean them with short and sweet grass; for, if hay and water be used, they become liable to swellings and the rot.

In other parts of England, a composition called linseed-milk is found to be of considerable utility for this purpose. The principal ingredients of which are, a small quantity of linseed oil-cake finely pulverised, which may be increased as occasion may require, in proportion as the calf becomes accustomed to it, and gradually mixed with some skimmed milk, sweetened with treacle. This must be made nearly as warm as new milk, when first taken from the cow. An infusion of hay, called indiscriminately hay-tea, or hay-water, mixed with linseed, and boiled down to the consistence of a jelly, has likewise been tried with success; as also a species of water-gruel, consisting of nearly one-third barley, and the remainder of oats, ground very fine. A similar composition is used in the county of Cornwall (England), the only difference being the addition of scalded or skimmed milk These are some of the principal modes adopted for the rearing and weaning of calves; from which, in general, the rest differ but little.

We extract the following successful experiment of rearing calves without milk. from the Transactions of the Bath Society. vol 5

"The following is as near a calculation of the expenses of rearing my calves without milk as I can at present assert. In the year 1787, I weaned seventeen calves; in 1788, twenty-three, and in 1789, fifteen. I bought, in 1787, three sacks of linseed, I put one quart of the seed to six quarts of water, which by boiling ten minutes became a good jelly; this jelly is mixed with a small quantity of the tea of the best hay steeped in boiling water.

"Having my calves to drop at different times, I did not make an exact calculation of the expense of this hay-tea, but out of my three sacks of seed, I had better than two bushels left at last. I gave them the jelly and hay-tea three times a-day - to the boy who looked after them 6 pence per day: the price of the linseed was 4 shillings

and 6 pence per bushel: the whole three years seed 2*l.* 5*s.* My calves are kept in a good growing state, and are much better at this time than my neighbours, that are reared by milk: they do not fall off so much when they come to grass."

The fattening of calves, from the esteem in which their flesh is held, is an object of importance, especially in the vicinity of London, where the lands are not so profitable for breeding cattle, as in other parts of the country; and the methods used for that purpose are as various as those for rearing them. Since the improvements which have taken place in rural economy, calves have a much greater variety of food than before. Grains, potatoes, malt-dust, pollard, and turnips, together with sweet hay, now constitute their common aliment But in order to make them fine and fat, the best and most efficacious way is, to keep them as clean as possible, by elevating the coops in such a manner that the sun may not have too great power over them, and to such a height above the level of the ground, that their urine may pass off; by giving them fresh litter every day, and suspending over the coop a large chalk-stone, so that they can easily lick it. Besides this, it is usual to bleed them when they are about a month old, and again just before they are slaughtered; which practice contributes in a considerable degree to the beauty and whiteness of the flesh, and is therefore more frequently repeated by some persons; but this is not altogether necessary; twice bleeding being fully sufficient for that purpose, in the opinion of the most experienced breeders. It is, however, to be observed, that those calves which are intended for bulls, or to be gelt for oxen, should be selected as soon as possible; as for the latter operation they should not be older than twenty days.

Distempers. From the first day of their birth, calves are subject to various distempers, which require great attention. The earliest is that generally called the *scouring*, for which an ingenious correspondent in the *Annals of Agriculture* (vol. xix. p. 437) prescribes a mixture of powdered chalk and wheat-meal wrought into a ball with gin, as a medicine that may be given with safety. They are also liable to be hoven, in which case, the thrusting of the penknife through that part of the swelling which rises highest near the hip-bone, and introducing a large quill into the orifice, have been attended with success in relieving them. The *shoote* is another distemper which is particularly fatal to calves, and attacks them a few days after their birth. The symptoms generally are, 1. A colic more or less violent, which is often very severe and dangerous, especially when it is infectious. This antecedent colic is terminated, and the animal relieved, by a discharge taking place from the bowels; but this is sometimes fatal before the *shoote* appears 2. A loathing, and refusing of food, even previous to the evacuation, which increases and decreases in proportion to the violence and duration of the distemper. In this disorder, the cheapest, and perhaps the best medicine which has generally been administered by several experienced breeders, is milk well mulled with eggs; or eggs and flour properly mixed with oil, melted butter, and mucilaginous roots, or seeds, such as linseed, aniseed, &c. But the most fatal of the various diseases to which calves are subject, is that denominated in Herefordshire, the *gut-tie*, where it most commonly prevails; the symptoms of which are, a total stoppage in the bowels, except a copious discharge of blood and mucus, accompanied by a violent fever, that occasions the affected animal to kick at its belly, lie down and groan. This is the effect of an erroneous method of castration, which causes a stoppage in the bowels, and brings on mortification, and which in a few days proves fatal. The only safe mode of cure is, to make a perpendicular incision four inches under the third vertebra of the loins over the paunch, or stomach, and introduce the arm to find the part affected, the beast being kept, if possible, in an erect position, by the help of proper assistants. In order to remove the stoppage in the stomach occasioned by the *tie*, and to carry off the fever, four ounces of Glauber's salts, two ounces of cream of tartar, and one ounce of senna, infused in two pints of boiling water, are given, to which are added half a pound of olive oil; the whole of this is worked off with gruel, in which mallows and alder-bark have been infused. In order to avoid any farther detail of this and the preceding distempers, we must refer our readers to the third volume of Mr. Young's *Annals of Agriculture*, p. 200—216; and to the second volume, p 98—104, of the *Repertory of Arts and Manufactures*.

CALIBER, denotes the diameter of

a body, but is usually applied to the bore of a gun, cannon, &c.

CALICO, a stuff or cloth of cotton, originally manufactured in India; but, within the last twenty or thirty years, it has been imitated in Britain, and brought to great perfection, since the invention of machines for spinning cotton. In the towns of Manchester, Glasgow, Paisley, &c. many thousands of industrious hands are employed in the manufacture of this article. These cloths, whether plain, printed, dyed, stained, or painted, chints or muslins, are all included under one general denomination. The printing of calicoes commenced in London about the year 1676.

CALICO-*Printing*: the art of cloth-printing or calico-printing, in other words, of dyeing in certain colours particular spots of the cloth, or figures impressed on it, while the ground shall be of a different colour, or entirely white, affords perhaps the most direct and obvious illustration of the application of chemical principles. The mordant which is principally used in this process is the acetate of argil. It is prepared by dissolving 3 lbs. of alum and 1 lb, of acetate of lead in 8 lbs. of warm water. An exchange of the principles of these salts takes place: the sulphuric acid of the alum combines with the oxyde of lead, and the compound thus formed being insoluble is precipitated, the acetic acid remains united with the argil of the alum in solution. Some calicoes are only printed of one colour, others have two, others three or more, even to the number of eight, ten, or twelve. The smaller the number of colours, the fewer in general are the processes

1. One of the most common colours on cotton prints is a kind of nankeen yellow, of various shades down to a deep yellowish brown, or drab. It is usually in stripes or spots. To produce it, the printers besmear a block, cut out into the figure of the print, with acetite of iron, thickened with gum or flour; and apply it to the cotton, which, after being dried and cleansed in the usual manner, is plunged into a potash ley. The quantity of acetite of iron is always proportioned to the depth of the shade. 2. For yellow the block is besmeared with acetite of alumina. The cloth, after receiving this mordant, is dyed with quercitron bark, and then bleached. 3. Red is communicated by the same process; only madder is substituted for the bark. 4. The fine light blues which appear so often on printed cottons, are produced by applying to the cloth a block besmeared with a composition, consisting partly of wax, which covers all those parts of the cloth which are to remain white. The cloth is then dyed in a cold indigo vat, and after it is dry, the wax composition is removed by hot water. 5 Lilac, flea brown, and blackish brown, are given by means of acetite of iron; the quantity of which is always proportioned to the depth of the shade. For very deep colours, a little sumach is added. The cotton is afterwards dyed in the usual manner with madder, and then bleached. 6. Dove colour and drab, by acetite of iron and quercitron bark. When different colours are to appear in the same print, a great number of operations are necessary. Two or more blocks are employed, upon each of which that part of the print only is cut, which is to be of some particular colour. These are besmeared with different mordants and applied to the cloth, which is afterwards dyed as usual. Sometimes the patterns are engraved on copper rollers, or on copper plates, and the colour is supplied by blankets smeared with the colour or the mordant required.

CALIPH, the chief sacerdotal dignity among the Saracens or Mahometans, vested with absolute authority in all matters relating both to religion and policy. In the Arabic, it signifies *successor* or *vicar*; the caliphs bearing the same relation to Mahomet as the Popes to JESUS CHRIST, or St. Peter It is at this day one of the Grand-Signior's titles, as successor of the Prophet: and of the Sophi of Persia, as successor of Ali. The government of the original caliphs continued from the death of Mahomet till the 655th year of the hegira.

[CALOMEL. Boil 25 lbs of quicksilver with 35 lbs. of oil of vitriol, of the specific gravity 1,85 to dryness. Triturate 31 lbs. of this dry salt with 20½ lbs of quicksilver: then add 17 lbs of common salt, (muriate of Soda): sublime. The produce is from 46 to 47 lbs. of calomel, which must be well levigated, in washed pure water, dried and sifted.

A patent has been taken out in London for reducing calomel to a fine powder, by putting the sublimed calomel coarsely powdered and mixed with the due proportion of mercury into a large earthen crucible or retort, and distilling it into water, which must not be cooled during the process.

Calomel, as a purge, requires some additional cathartic more immediately active. Hence, for an adult it is usual to give as a full purge ten grains of calomel with from 16 to 20 of jalap.—T. C.]

CALORIC, a term employed in the new chemical nomenclature to denote the cause of heat, as distinguished from the sensation. Heretofore the language of chemistry had been perplexed by the use of the word 'heat' to express both these ideas indiscriminately; it is therefore with great propriety that the latter term is now applied to one of the effects of that principle, which, as the cause of that effect, is denominated caloric; and it would conduce very much to perspicuity of expression, if this distinction, both in speaking and writing, were uniformly regarded.

The principal sources of caloric, are, the sun, combustion, and various other instances of chemical action, percussion or collision, friction, the electric spark, and galvanism.

Caloric is always sensible or latent. The proportion of it in any body is always sufficiently indicated either by its temperature, or its state.

CALUMET, a symbolical instrument of great importance among the Indians of America. It is a smoking pipe, the bowl of which is generally made of a soft red marble, and the tube of a very long reed, ornamented with the wings and feathers of birds. This instrument, the use of which bears a great resemblance to the caduceus of the Greeks, is on all occasions a pledge of peace and good faith.

CALVINISM, the doctrine and sentiments of JOHN CALVIN, who flourished at Geneva about the year 1541. The doctrinal parts of this system differ from that of other reformers of Calvin's period, chiefly in what regards the absolute decrees of God, by which, according to this teacher, the future and eternal condition of the human race was determined out of his sovereign will: that is, Calvin denied the free agency of man, and maintained predestination. In France, the Calvinists are distinguished by the name of *Huguenots*. In Germany, they are confounded with the Lutherans, under the general title of *Protestants*; or sometimes distinguished by an addition of the epithet *reformed*.

CALYCANTHUS FLORIDUS. SWEET SCENTED SHRUB, Carolina All-Spice. This favourite shrub is a native of the southern states, and occupies a considerable range of hilly country beneath our chains of mountains, from Pennsylvania to West-Florida. This shrub is of a middle size, many stems ascending from the same source, eight feet high, covered with a brown aromatic bark, with two entire leaves placed opposite on every joint, on short foot stalks. The flowers grow single, on short peduncles at the extremity of the branches: they have two series of narrow thick petals, which spread open and turn inward at the top. These are of a dusky purple colour, of a scent composed of the pine-apple and the strawberry fragrance. The pericaps are also highly aromatic. There are two varieties: one with long leaves; another with round leaves. The flowers appear late in May.

This charming shrub bears the climate of Pennsylvania very well, and may be easily propagated by laying down the young branches, which will take root in one year, and may then be taken from the mother plant, and set where they are designed to remain; for they do not bear transplanting well, after they are grown to a tolerable size.

CALX properly signifies lime; but the term is also used by chemists and physicians for a fine powder, which remains after the calcination of metals and other mineral substances. All metallic calces are found to weigh more than the metal from which they were originally produced. See CALCINATION. [Calx of a metal = oxyde.]

CALYX. See BOTANY.

CAMBLET, or CHAMBLET, a stuff made of wool, silk, and sometimes of hair, especially that of goats, combined with the first-mentioned substances. In some, the warp consists of wool and silk, and the woof of hair. The real oriental camblet is made from the hair of the Angora goat. There are no camblets made in Europe of goat's hair alone: France, Holland, Flanders, and England, are the chief places where this manufacture is carried on. Those of Brussels are allowed to be of the finest quality, and those of England stand next in repute.

These articles are of various kinds, which are denominated *figured* camblets, *watered* camblets, *waved* camblets, &c.

CAMBRIC, in commerce, a species of very fine white linen, made of flax, which derives its name from Cambray, a city of France, where it was first m-

vented. This article has long been an object of considerable advantage to the French, who formerly drew large sums annually from England, by its sale. The cambrics now worn in Great Britain are chiefly made in Scotland and Ireland.

CAMEL, in natural history. This animal is found in Asia and Africa, and is easily domesticated. Camels are patient of labour, and will carry immense weights. They will travel eight or ten days without water, which they scent at a distance of half a league, and drink most copiously when they reach it. Besides the four stomachs peculiar to other ruminating animals, they have a fifth for the purpose of holding water, which they can preserve unmixed with the other liquors of the body, and from this stomach, they can, by the contraction of certain muscles, make the water mount into their throats and proper stomachs to macerate their dry food. They kneel down to be loaded and unloaded, at the command of their keepers. The milk and flesh of camels are used as food, and their hair is used in the manufactures of the most costly stuffs. The CAMELOPARD is a native of several parts of Africa, living in forests, and on the leaves, as food. It is mild and inoffensive, and, in cases of danger, has recourse to flight for safety. When obliged to stand on self-defence, it kicks its adversary. Its usual pace is a quick trot. The camelopard was introduced into Europe anciently by Julius Cæsar; and in more modern times, one was presented in the 16th century by the Dey of Tunis to Laurentius de Medicis.

CAMEL, in mechanics, an ingenious machine, by means of which vessels are raised over bars that would otherwise interrupt their course. The camel was invented by De Wit for the use of Holland, and carried to Petersburgh by the Czar. A camel is composed of two separate parts, whose outsides are perpendicular, and whose insides are concave; shaped so as to embrace the hull of a ship on both sides. Each part has a small cabin, with sixteen pumps and ten plugs, and containing twenty men. The two parts are braced to the ship under water, by means of cables, and when fitted entirely, inclose its sides and bottom. Being towed to the bar, the plugs are opened, and the water admitted, until the camel sinks with the ship, and runs aground. Then the water being pumped out, the camel rises, lifts up the vessel, and the whole is towed over the bar. This machine, which is thought to strain very large ships; can raise the vessel eleven feet; that is, make her draw so many feet less water.

CAMERA OBSCURA, or *dark chamber*, a machine or apparatus, in which the light being collected and thrown through a single aperture, external objects are exhibited distinctly, and in their native colours, on any white surface placed within the chamber or receptacle. A miniature picture, thus set forth in the most accurate and natural manner, is in all cases a pleasing object; and, consequently, the *camera obscura* furnishes a source of elegant amusement. To those unhabituated to sketching, it affords an opportunity of delineating objects and prospects with the utmost exactness; and a painter cannot study these living pictures from the very pencil of nature herself, without deriving considerable advantage.

CAMP, the ground on which an army pitches its tents. An army always encamps in the front of the enemy; and generally in two lines, running parallel, at about 500 yards distance from each other; the horse and dragoons on the wings; and the foot in the centre.

CAMPAIGN, in the art of war, denotes the space of time in which an army acts on the offensive, or is encamped.

CAMPHOR, a white, solid, transparent resin, of a very volatile penetrating smell, and a bitterish aromatic pungent taste, accompanied with a sense of coolness. It is chiefly extracted by sublimation from the wood and roots of the *Laurus Camphora*, L. a tree growing in Sumatra and Japan, but may also be obtained in small quantities by distillation, from a variety of vegetables, such as the peppermint, cardamoms, &c. in which it may easily be discovered by their peculiar camphorated odour, and their cooling pungent taste. From these, the camphor may be disengaged by distillation, either in a pure state, or in combination with essential oils. In order to separate it, dissolve the whole of the camphorated oil thus obtained in a proportionate quantity of alcohol: then dilute this solution with twelve times the quantity of distilled water: if the oil contain no camphor, the water used for the mixture will remain clear and transparent; the alcohol will gradually combine with it, and the oily particles

separate. On the contrary, if the oil be mixed with camphor, the whole mixture will be converted into a milky liquor from which the camphor will be gradually precipitated in the form of a white powder, while the oily parts ascend to the surface of the water. By melting this powder in a close glass vessel, over a moderate fire, it will assume the concrete form of camphor; though the remaining liquid will retain a small portion of this substance, as well as of essential oil.

Camphor, in modern practice, is chiefly employed externally to diminish inflammation, to disperse tumours, to obviate mortification, to stimulate in cases of local palsy, and to allay rheumatic and paralytic pains.

Internally, camphor is given in nervous affections, in order to excite the vital power, and alleviate spasmodic complaints.

CANADA BALSAM, a transparent resinous juice, of an agreeable smell, and a warm pungent taste. It is imported from Canada, in North America, and may be considered as a very pure turpentine, being obtained from a species of the fir-tree. The genuine kind is of a light amber colour, and a firm consistence. Although it has not hitherto been much employed in medicine, yet it appears to be possessed of all the properties and virtues attributed to the balsam of COPAIVA, to which we refer.

CANAL, an artificial cut in the ground, which is supplied with water from rivers, springs, &c. in order to make a navigable communication between different places. There are various circumstances, upon which the particular operations, necessary for constructing navigations, depend; and which consequently increase, or diminish, the labour and expense of executing them: such as the situation of the ground; the vicinity to, or connexion with rivers; the facility or difficulty with which the necessary quantity of water can be procured; and many other requisites. The utility of canals to a trading nation are too well known to be dwelt upon at length. By means of a canal, one horse will draw as much as twelve horses on a level road on land. A canal is one of the most useful as well as arduous labours in which the industry of man has been employed. The difficulties surmounted, and the magnitude of the work, are often, in these cases, objects of equal admiration. The canal of Languedoc, in France, by which the main ocean communicates with the Mediterranean, by a navigation of 64 leagues; and that which runs 825 miles from Canton to Pekin, in China, are among the most remarkable at present in existence. Within these few years, a great number of canals have been cut in Great Britain. Most of the counties between the mouth of the Thames and the Bristol-channel are now connected together by natural or artificial navigations The most extensive on the island are the duke of Bridgewater's in Cheshire, and that between the Forth and the Clyde in Scotland. The obstacles that present themselves, in an enterprise of this kind, are generally various and innumerable. If the ground to be cut were a dry level, nothing but a reservoir of water would be necessary: but if the course is to pass through marshes, mountains, and rocks, and over rivers and valleys, it is easy to perceive that the engineer must have constant employment for his invention, the labour and expense will be enormous, and the progress frequently tedious. In one place, a tunnel is to be cut through a hill or quarry; in another, an aqueduct-bridge is to be thrown over water, or across a dale. Beside these grand impediments, the general inequality of the ground renders it necessary to provide *locks*, in order to raise or lower the water to a level which, along the whole course, is perpetually varying The largest canal in England is that which runs across the Isle of Dogs, being between 40 and 50 yards wide.

CANARY BIRD, or *Fringilla canaria*, is a species of finch, and a native of the Canary Islands. It is supposed to have been first brought to Europe in the 14th century. At a still later period, canary birds were more generally introduced into Germany, where the greatest attention is paid to the breeding and rearing of these beautiful creatures, which are much celebrated for their song, and docility in imitating musical notes. Hence they have become a source of considerable emolument to the Tyrolese, who export vast numbers to various parts of Europe, and also to England. If treated with proper care, they will breed, and become as vigorous and healthful in this country, as in their native islands.

These delicate birds are subject to a variety of diseases: to prevent which, the greatest care should be taken to provide them with pure water and simple food.

During the time of moulting, which often proves fatal to many of them, a little white wine dropped on a piece of biscuit, or sugar, will be of a considerable service.

For a more particular account of their early captive state, and improvement in colour, shape and song, the reader is referred to BUFFON's *Natural History*.

The following original observations, upon raising these pleasing songsters, were furnished by a friend, who has paid uncommon attention to the subject.

The account though minute is highly valuable, because it is the result of long experience, and nothing has ever been published on the subject in the United States. The Editor has pleasure in thinking, that, by communicating the history of the economy of these pleasing birds, he has laid the foundation for a permanent and rational source of amusement, especially to those in retired situations.

Colour of Canary Birds in general.—The colours of canary birds are various, those most regularly spangled with several rich and glowing colours distinctly marked, are to be preferred, especially when the bright yellow or clear white is contrasted with a deep green, black, chocolate or dove. Those of the last mentioned colour are called agates: when a rich yellow and chocolate colour are united, the combination is very grateful to the eye, but it must be observed that *fine feathers do not always make fine birds*, for many of the handsomest shaped and best breeders are found among the plainer coloured, and any person intending to rear them, should pay more attention to the latter, than the former qualities, as he can seldom find them all united in the same bird.

Shape.—The body and legs, especially of the males, should be long; the eyes large, the feathers close, tail long and but little forked or spread. Topknots add much to the appearance of the bird. The claws should be short and clean, for when clogged with dirt, they bespeak a sleepy, lazy disposition, not likely to entertain with frequent songs.

Song.—In this there is also a great variety, and Canary birds may be brought up to almost any note. Those that sing the longest and with the clearest note, and with the most gradual changes, are esteemed the best. Some have a way of chattering, and of breaking off, which has an unpleasant effect, and when a bird has once contracted any particular notes, he will seldom if ever lose them. On this account, when they are reared in a room, no strange bird must be admitted without first approving his song; for so docile and attentive are young birds to every particular note and turn in song, that by taking them early after leaving the nest, out of the way of hearing the old ones, they may be taught to imitate not only the notes, and tunes of the hand organ, but even its sound.

Disposition.—Some are bold and sociable, others are fearful and will not appear as if at home, unless while at a considerable distance from those who are observing them. The latter sometimes have a fine song, but the former kind is to be preferred, especially for the breeding room, for obvious reasons. In this country they seldom live longer than ten years, but in a single state they sometimes live longer. Much depends upon those who have the care of them. A great variety of food should not be given; continue that which is found to agree best with them—for the little creatures, pleased with something new, will often eat too great a quantity of things, which, if given sparingly to them, might have been not only of use, but gratifying. The cage should not cramp them, and it ought to be hung in a warm place, during the winter, and where the sun can *sometimes* shine on them: if no danger from cats is to be feared, the lower the cage is hung, the better, as most birds will be thus rendered familiar. For common food, mix two-thirds Canary seed, and one-third rape seed, and add about one-twentieth part of the whole quantity of hemp seed and oats, mix the whole well. Fill the food-box, if large enough to hold a week's food, but once during that period, and where a fountain is used to hold the water, this also need not be filled more than once during the same time in the winter, and three or four times a week in the summer. The cage bottom ought *never to be washed; but scraped dry only once a week*, at which time the bottom must be covered with river bar sand. A piece of loaf sugar, scuttle fish bone, or a small piece of soaked bread, stuck between the wires of the cage occasionally, and a little maw-seed is quite sufficient in winter, and in summer, chickweed or salad may be *sparingly* but daily supplied. A sprig of the former, and half a small leaf of the latter is enough at a time. Place a small basin of water in the

cage twice or thrice a week, to enable them to wash.

Sex.—Figure and colour are not sure marks of sex. When about to purchase, hear the birds sing; a cock's song may be distinguished from the chattering of a hen by the motion of the throat, which heaves freely up and down like a little pair of bellows, and the neck puffs, but in the hen this appearance of the throat is seldom if ever observed.

Age.—A young bird has clean short claws and legs; an old one always has long claws of a yellowish white colour, frequently very crooked, and their legs covered with a kind of scurf, or hard shelly substance, which in old birds is very perceptible.

On rearing Canary Birds in a Room. In rearing Canaries, the great error lies in feeding irregularly, and with too great variety, and in nursing them too much. In this state, Canaries generally breed three times in a summer, and lay from three to five eggs at a time. Seldom more than four young ones are raised in one nest, the eggs are commonly hatched in 12 or 14 days, but it will be right not to disturb the hen, or to take the eggs from under her, until after the 17th day from the time of laying the first egg shall have expired. If the eggs are not then hatched, the sooner they are taken away the better, as the longer she sits the more she will be kept from going to nest again.

After the hen has begun to sit steadily, she must not be interrupted, until the young are hatched, when the nest must be daily looked into, in order to take out any that may die.

Matching.—When any particular coloured or marked birds are desired to be propagated, put them with clean, fair, mealy, or cream-coloured birds, that have no marks on them, in preference to deep yellow or any other colour, always remembering, that a weak, small, or loose-feathered bird ought to be matched with a strong, large, close-feathered one, and that a top-knotted bird is best matched with one that is plain-headed, as two top-knots often produce bald heads. The best way to pair them is to hang them in separate cages near each other for a week or ten days, and then put them both in one cage for a week longer, and rather turn the hen into the cage the cock has been accustomed to, as it often happens that if the cock is turned into her's, that she becomes a Xantippe, and overpowers him for several days, which is a great disadvantage, as he is almost always afraid of her afterwards. If two birds have been paired one year, and bred together, they need never be put into cages to pair a second time, as they will generally, if not always, find their mates in the room, year after year, as long as they live.

Large strong birds are not best for the breeding room, especially when the males are of this description, as they generally fight for two or three hens after they are let loose, and thus derange a number of pairs, and cause confusion, so that birds of a moderate size and spirit, and just able to fight their way well in the room, are to be preferred; as they make the best parents, as well as the best neighbours.

Preparing the Room.—Let it be fronting the south, having a passage somewhere for the air to pass freely through in the heat of the season, it must first be well cleaned from all vermin, and then white-washed two or three times, and previously to the white-washing, every crack or crevice through which mice, cockroaches, or bed-bugs can enter, must be stopped up with mortar. These are all enemies to birds, and the bugs, though small, are often as injurious among the newly hatched young as any: let the window be well wired with a close meshed wire, for if this wiring be too open, they will often push their heads through, and sometimes not get them back again, and so hang themselves. In the room fix a shelf all round, about three feet from the floor; on this, place boards up and down of a foot wide, and three feet long, *slanted on the top*, and about two feet apart, which will form recesses, in which hang baskets or boxes for their nesting. The steep slant on the top is to prevent them from lighting there over the sitting birds, and frequently quarrelling with the hens on the nest. Through each board, bore several large holes, and put roosts through, so that when the birds which have taken possession of one recess may not, when they light on them, see their neighbours in the next; for if they do, their quarrels will be almost endless, during the season. In each recess, drive sprigs or nails, to hang boxes or baskets upon, (say two in each recess) on the opposite side of it, for hens often lay again before their young are out of the first nest; and if they do not find a box or basket very near them, they must fight for one in a distant part of the room and will, on such occasions, often mak

much disturbance, or else build a nest over their young, in the old one, which kills them before they can get out of it. Boxes ought to be about four inches square, and about an inch and a half deep, with a high back to bore holes through, for the purpose of hanging them up in the recesses; but baskets are much better than boxes, and should be made of fine willow, about three inches and a half over, and about two inches and a quarter deep; let these be nailed to a small piece of thin stuff of seven or eight inches long, and three inches broad; through which bore two holes to hang them on the nails on each side of the recesses, and it will soon be evident that the birds generally prefer them.—Swinging and standing roosts may be placed in the room, and others nailed about where most convenient, and the floor covered one inch deep with common river bar-sand, all over. The window should be so constructed as to open and shut with a weight and pully, without going into it to disturb them, and especially where a garret is used having a dormer-window. For building their nests, fine hay cut five or six inches long, and bent, and buck's tail or deer's hair is sufficient for them. With respect to the hair or tails, take great care to guard against the deer-bug breeding the stump of the tail, and sometimes in the skin, at the roots of the hair; but as the buck's tails, which afford both long and short hair, and of different fineness, are the best, let these only be obtained; cut off all the hair with large scissars, throw away the stump, and boil the hair well for a quarter of an hour; then dry it well in the sun, and pack it away in a close box or bag, and as it may be wanted, pull it apart, and throw it into the room. Two other observations may here be made; 1. With respect to the outer part of the window of the room: carefully guard it against the cats, which although they cannot get within, will often present themselves outside, and by their sudden appearance so frighten the birds, that they often fly with such force against a roost, wall, or partition, as to maim or kill themselves; 2. With respect to stocking the room, twelve or fifteen pair of birds, for a middle sized room, is quite sufficient; for if the room is overstocked, instead of ten or fifteen birds being raised by each pair, perhaps not more than from three to six will be raised in each nest, which will cause a greater expense and care, with a less increase.

Feeding.—As soon as the birds are let loose in the room, place their mixture of canary, rape, hemp-seed, and oats, as above mentioned, in pans or small boxes, with holes; also water in a large and shallow pan, and some in large fountains, and then begin with feeding with eggs boiled hard, and chopped up or grated, and well mixed with a third of the quantity of wheat bread. Let the number of birds be ever so great, begin with one egg, and gradually increase it daily, till your young birds begin to come out of the egg; then rest at an average of about four eggs a-day for twelve pair of breeding birds, remembering that the eggs must be sound, and are always to have about one-third the quantity of bread added to them when chopped or grated, and sometimes the proportion of bread may be lessened, and Naples biscuit used instead. Besides this food, they must be daily, but sparingly supplied with fresh greens, especially chickweed and salad; of the latter a very small quantity is sufficient, and of the former, be careful that it is not of the rank sort, but rather fine and full seed, feed with greens, and egg and bread, and mix or chop the latter fresh at least twice in the day, though thrice would be better in the longest summer days. The whole number of eggs may be boiled over night, or early in the morning, and their shells will preserve them sweet till used; beware of heavy or musty bread. When the young ones begin to fly about the room, if there be a considerable number of them, (say twenty or thirty) bruise a table spoonful of hemp-seed daily, and lay before them, mixed with a like quantity of maw-seed, and a piece of soaked bread may also be daily given them equal to a sixth part of the bread and egg; but if young birds appear to be too loose, lessen the quantity of soaked bread and greens, and increase that of the bruised hemp-seed and maw-seed, and mash some loaf-sugar on the feeding-table; and it will be well, early after the young fly about, to nail up a number of pieces of scuttle fish-bone in the room, and sometimes scrape a little fine chalk near to where the birds feed. Towards the latter end of August lessen the quantity of salad and chickweed, and substitute the small round plantain; use also the leaves and seed when full, but before it has become ripe and dry. There is also a kind of grass which shoots high in seeding, and forms a kind of little fox-tail,

of which the birds are very fond before it is quite ripe, and they may be freely indulged with it.

Treatment during sickness and in moulting.—When a bird is sick it will generally crouch, and hang its wings, appearing in a heap. When it puts the head under the wings, great danger is to be apprehended When sick, and the bird discharges its dung, it will bolt its tail afterwards; and the discharge will have the appearance of a slimy whiteness without any black in it.

Having passed the dangers of the first moult, birds seldom sicken unless from want of regular care. 'When a bird droops, examine the water and food, and if either have been neglected, give both in very small quantities, and only once in an hour, during the first day: for death will soon follow a sudden repletion after long abstinence. If they do not suffer from fasting or thirst, observe the dung; if thin and watery, and without any black, it may be concluded that too much opening food has been eaten In this case, give sparingly of scraped chalk, scuttle fish-bone, and hemp-seed bruised, or maw-seed. If an old bird be sick from no apparent cause, give a choice of the above articles of food, as he will seldom eat any thing injurious in its nature; but when well, confine it to the usual food. With young birds, (during the first year) a general choice of food must be avoided, as they will injure, and sometimes kill themselves by eating improper food.

The first disorder young birds are subject to, is a *surfeit*, arising from over-feeding, either by the old ones or themselves, with too much greens, especially of that species of chick-weed which has little seed, but is rank and full of leaves. The surfeit may be known by blowing the feathers aside from the lower parts of their bellies, which will appear swelled, and almost transparent, shining and full of red veins; and their bowels sunk toward the extreme parts of their bodies; and when this swelled part is of a dark-brown colour, the bird seldom recovers. This disorder also frequently happens from exposure to cold while in the moult, and during cold damp weather, when the north windows of the room happen to be left open. This negligence must be carefully guarded against, for when a large number of birds are together, it is difficult to nurse a few with proper food, without the risk of injuring those that are in health.

Moulting generally begins within six weeks after the birds are hatched, and is a very dangerous time; one-fifth generally dying during the first moulting. But as a prudent management of them, in that state, will lessen the danger, the following short directions are given:

When moulting, the bird appears rough and sleepy, putting its head under its wings. The first year they only shed their down and small feathers; but afterwards they annually shed their feathers, including those of the wing and tail.

The room must be kept warm, and a place allowed them where they may lay in the rays of the sun *at pleasure*; and the north aperture closed, when cold N. or N. W. winds blow. Scrape some loaf sugar upon the table, and mix Naples biscuit with the egg and bread, and increase the proportion of bruised hemp and maw-seed. Give also a small quantity of sound oats or lettuce-seed, the latter will be eaten if bound in their bowels: if the weather be very warm, the addition of a few leaves of the common short plantain daily, will be proper.

In the aviary, when the old birds are breeding and begin to moult, do not disturb them more than is absolutely necessary, as their feathers are easily injured, while the quill part is filled with blood, and the loss of any of them would cause pain. Finally: Naples biscuit, bread and hard egg, are called warm nourishing food; rape-seed, hemp-seed, maw-seed, scuttle fish bone, chalk, and loaf sugar are astringent (hemp-seed the most so); and chick-weed, salad, plantain, and other greens, soaked-bread, lettuce-seed, and oats, are all of a purgative cooling nature. Proper attention being paid to these qualities of the different kinds of food, and to the effects produced by them on sick birds, these little songsters may be more easily raised than is commonly imagined. The CARDINAL RULE IS, REGULAR CARE—*For though they may be well attended for six days, yet if neglected on the seventh, the young will perish*

CANCER, a round, though unequal, and, at first, indolent tumor, generally situated in glandular parts, such as the breasts, arm-pits, &c. When this tumor grows large, it is of a livid, blackish, or leaden hue, and attended with excruciating pain, it is

called an *occult* cancer; but, when it becomes a sore, or ulcer, discharging a very fetid, ichorous matter, it is then an open, or *ulcerated* cancer. The latter species is by far the most dangerous, and has by the best practitioners of all ages, been considered as incurable by any *internal* remedies; the occult cancer, however, has sometimes, especially before it had attained a considerable size, been cured by external applications, of which we shall give a short account.

The causes of this formidable disease are not distinctly ascertained; though its origin is supposed to depend chiefly on a scrophulous predisposition of the body; which if increased by depressing and debilitating passions of every description, as well as the cessation of periodical and salutary fluxes of blood, frequently produces that fatal malady.

The peculiar acrimony of the fluids, which, by its stimulus, often changes a scrophulous ulcer into a true cancer, is of a very diversified nature; and thence arise the various forms and characteristics of this complaint, as well as the numerous difficulties with which the cure of it is attended. Hemlock and arsenic, used internally, and applied externally, have indeed, in a few instances, been attended with success; but it is, on the other hand, very doubtful whether these, or any other medicine, have ever cured a *real* cancer. Hence it is generally believed, that extirpation by the knife is the only certain remedy.

In cancers of the face, Dr. HANDEL has lately, and with uncommon success, prescribed the application of the expressed juice of the *Carduus tomentosus*, L. the woolly-headed thistle, or friars' crown. This simple remedy was formerly in great repute, and strongly recommended by BORELL, STAHL, TIMMERMANN, and other continental physicians. Dr. HANDEL ordered his patients to anoint the parts affected, with the fresh juice, six or eight times every day; and he found, that, in the course of a fortnight, it checked the progress of the most malignant cancer. Dr. WILLICH has, in *one* instance only, observed a similar happy effect, though there always appeared to be great alleviation of pain, and an abatement of the fetid smell, emitted from cancerous ulcerations, when this liniment was duly administered. For this purpose, he made use of a soft feather, but previously added to the juice about the eighth part of rectified spirit of wine, in order to precipitate the feculent particles, and also with a view to preserve it longer in a sweet state. Dr HANDEL farther asserts, that by the application of this juice, after the necessary internal remedies had been used, he has cured the itch, scald heads in children, the thrush, violent inflammation of the eyes, inveterate ulcers of the legs, &c especially in those constitutions which had been reduced by the use of mercurial medicines. Notwithstanding these favourable accounts, we doubt whether a confirmed cancer will ever yield to such superficial treatment; nay, it is admitted by all those foreign practitioners, that the juice of the woolly headed thistle was of service *only* when applied to cancerous ulcers in the face, and produced no relief whatever, where the female breast was afflicted with that loathsome disorder. In such cases, unfortunately, all remedies hitherto discovered have been found ineffectual, unless they were applied in the earliest stage of the cancerous tumor. Thus it is affirmed by BROOMFIELD, COLLIGNON, CULLEN, THEDEN, UNZER, and many other medical men of eminence, that the *timely* use of the *belladonna*, or deadly nightshade, has often dispersed glandular indurations, and large tumors of this description; but, as the internal administration of this virulent plant cannot safely be intrusted to those who are unacquainted with its nature, and the constitution of the human body, we shall only remark that it may, with equal advantage, be employed *externally*. For this purpose, the leaves of the deadly nightshade should be boiled in milk, to form a decoction sufficiently strong, and with which the part affected must be frequently fomented.

Many volumes have been written on cancers, and numerous remedies recommended for the cure of this disease. It appears for the most part at first in the form of a moveable hard lump, and if then extirpated by a careful surgeon, may be easily cured. But by delay, and tampering with quack remedies, internal ulceration takes place, and death very commonly ensues, after submitting to ineffectual operations and undescribable torture from the disease. As an urging argument in favour of early extirpation, it may be mentioned that Mr HILL in his surgery, relates, that he cut out *fifty* cancers from persons, all of whom except ten were below 50 years of age. I have

also seen the late Dr. JONES of Philadelphia, operate for cancers, which he informed me at the time, had increased to many times the size of the tumors when he first saw them and advised the operation. Tumors in the lips, or any part of the head or neck, ought especially to obtain the earliest attention.

As a concluding advice, the Editor thinks it his duty to bear a testimony against the prejudices too prevalent in this and most other countries, in favour of the merit of men who undertake the cure of *cancers, solely.* They have done, and continue to do mischief in the United States, being half-bred doctors, profoundly ignorant and incapable of distinguishing a genuine cancer from common tumors, and foul ulcers They universally profess to use vegetable remedies, but *Arsenic* is the general application, variously disguised.

Where a case does not admit of cure, it is still of consequence to diminish the evils attendant upon so dreadful a malady. The disagreeable fetor of the discharge may be abated by the application of scraped carrots, or by yeast or charcoal dust mixed with flour and honey.

CANCER, in astronomy, one of the twelve signs of the zodiac, represented on the globe in the form of a crab, and marked ♋ in the books.

CANCER, the crab, in natural history, is reckoned among the insects. Crabs have eight legs: they cast their shells annually; previously to this their limbs shrink to facilitate their extrication. The loss of a limb, with other animals, is irreparable, but with regard to crabs it is but of little importance, as in a few weeks another is reproduced. The lobster is a species of the crab: this is extremely prolific, depositing about 12,000 eggs each time of laying.

CANDLE, a light made of tallow, wax, or spermaceti, the wick of which is usually composed of several threads of cotton

There are two species of tallow candles, the one dipped, and the other moulded; the first are those in common use; the invention of the second is attributed to LE BREGE, of Paris. Good tallow candles ought to be made with equal parts of sheep and ox-tallow; care being taken to avoid any mixture of hog's-lard, which occasions a thick black smoke, attended with a disagreeable smell, and also causes the candles to run

When the tallow has been weighed and mixed in due proportions, it is cut very small, that it may be more speedily dissolved; for otherwise it would be liable to burn, or become black. if left too long over the fire. As soon as it is completely melted and skimmed, a certain quantity of water, proportionate to that of the tallow, is poured in for precipitating the impure particles to the bottom of the vessel. This, however, should not be done till after the three first dips; as the water, by penetrating the wicks, would make the candles crackle in burning, and thereby render them useless. To purify the tallow still more, it is strained through a coarse horse hair sieve into a tub; where, after having remained three hours, it becomes fit for use.

[When the tallow is very dirty or rancid, an ounce of pearl-ash to about 10 lbs of tallow, put into the water wherein the tallow is melted, is of service.—T C.]

Wax Candles are of various kinds and forms: they are made of cotton or flaxen wicks, slightly twisted, and covered with white or coloured wax. This operation is performed either by the hand or with a ladle. In order to soften the wax, it is first worked repeatedly in a deep narrow cauldron of hot water: then taken out in small pieces, and gradually disposed round the wick, which is fixed on a hook in the wall, beginning with the larger end, and diminishing in proportion as the neck approaches; to prevent the wax from adhering to the hands, they are rubbed with oil of olives, lard, or other unctuous substance When it is intended to make wax candles with a ladle, the wicks being prepared as above mentioned, a dozen of them are fixed at equal distances round an iron circle, which is suspended over a tinned copper vessel containing melted wax; a large ladleful of which is poured gently and repeatedly on the tops of the wick, till the candles have acquired a proper size, when they are taken down, kept warm, and smoothed upon a walnut-tree table with a long square instrument of box, which is continually moistened with hot water, to prevent the adhesion of the wax In other respects this mode of making wax candles corresponds with that of manufacturing them with the hand.

From the increasing demand and price of wax, various experiments have been tried, in order to discover proper substitutes, which might possess similar solidity. We are informed by a

foreign journal, that this desirable object has been satisfactorily attained, by melting down an equal quantity of tallow and resin. In order to ascertain the truth of this assertion we were induced to repeat the experiment, but without success: for, though the two substances incorporated, they had not a sufficient degree of cohesion; and, when moulded into a proper form, the tallow burned, but the resin dissolved, and separated from it.

Although candles are preferable to lamps, as their light is less injurious both to the eyes and lungs, and as they do not produce so great a volume of smoke, yet a clean chamber lamp, which emits as little smoke and smell as possible, is far superior even to wax candles; for. 1. As all candles burn downwards, the eye necessarily becomes more fatigued and strained during the later hours of candle-light; 2. Because they yield an irregular light, which occasions the additional trouble of snuffing them; and lastly, because, if the air be agitated ever so little, or if the candles are made of bad materials, they injure the eye by their flaring light. [A common candle requires to be snuffed 40 times in an hour. Wicks are better for being first dipt in wax: indeed, mould candles of tallow, are greatly improved by one fourth of white wax.—T. C.]

Prof Hermbstadt, of Berlin, finds by experiment, that pure white wax candles, are, with regard to the time they last, the most economical:* that tallow candles, provided the wicks be in proportion to the tallow, *burn the slower the smaller they are*, because in larger ones a greater quantity of the substance is wasted in burning; the *oxygen* (pure air) cannot act upon the whole flame, and the increased heat disperses the combustible matter in vapour, without decomposing the air which would augment the light. He also finds that spermaceti candles are subject to the greatest waste of any, and emit more smoke than tallow-candles, although their vapour causes no disagreeable smoke like them † He thinks that those candles would be the brightest, and afford the most pleasant light, which, instead of a round, were made with a broad flat wick, or rather in the form of a hollow cylinder, that the air might act upon the flame both internally and externally.

By the result of minute observations, it appears that a pound of common candles, 12 in the pound, burn 41 hours, 24 minutes; a pound of mould-candles, 5 7-8ths in the pound, 42 hours, 39 minutes; a pound of common candles, 8 in the pound, 34 hours; and a pound of mould-candles, 4 in the pound, 36 hours, 20 minutes. Hence mould-candles are more economical than common candles, if they remain at rest while burning. *See* Cooper on Gas Lights.

[*Economy in Candles.*—In such candlesticks as are not made to slide, the candles are frequently permitted to burn in the socket to great waste, and to the injury of the candlestick; this may be prevented by taking out early the short piece of candle, placing it between three common pins stuck in an old cork, and putting the cork in the candlestick. A pound of candles 10 to the pound, will give a greater quantity of light by one fourth, than a pound of 6 in the pound because the tallow is more perfectly consumed in consequence of a greater surface of wick being exposed to the air. In large wicks the tallow is not burnt but distilled away —T. C]

CANDLEMAS, a feast of the church, held on the 2d of February, in honour of the purification of the Virgin Mary On that day, the ancient Christians used an abundance of lights, both in their churches and in processions. Candlemas term begins the 15th of January, and ends the 3d of February.

CANES, Common Walking (*Calamus scipionum*) have a smooth and glossy stem, usually marked with dark spots: and the knots or joints sometimes three or four feet asunder.

They grow very abundantly in Sumatra and other eastern islands, as well as on the continent of India, whence they appear to have been originally exported to Europe by the Dutch. There is a considerable trade in them to China. Their long internodes and shining surface have rendered them preferable to most other articles for walking canes.

The True Cane, or *Rattan*, (*Calamus verus*) is remarkable for growing to the great length of a hundred feet and upwards, and at the same time not being thicker than a man's finger.

A trade in rattans to considerable extent is carried on from several islands of the east to China, which is the principal market for them. These canes are extremely tough and flexible, of yellowish brown colour, and, when cut into thongs, are sometimes used to

* They are not so in Philadelphia —T C.
† The contrary is found in Pennsylvania. —T. C

make cables and other ropes. Our cane bottomed chairs are made of split rattans, the outer or smooth surface of which is always kept upward. For this work the canes are chosen by their great length, pale yellow colour, and bright gloss. They are purchased in bundles, each of which contains a hundred canes, neatly tied in the middle, and the ends bent together. When perfectly dry they are so hard that it is said they have been known to give fire when struck against each other. The word rattan, in the Malay language, signifies a staff or walking stick.

CANIS, the dog. The chief peculiarities of the tribe of dogs are these. They cultivate the society of men, and are but rarely found wild: they feed on flesh and farinaceous vegetables: they digest bones: they are extremely docile, affectionate and vigilant in their intercourse with men: they have an aversion from strangers, and particularly beggars. They are capable of imitation and instruction, and in many instances seem endowed with almost human intelligence. It is said that a Florentine noblemen had a dog that would wait at table, change his plates, and carry his wine with the utmost steadiness. About the year 1806, a watchman in the neighbourhood of London, fell down the deep area of a new house, and was unable to rise; his dog ran to the nearest public house, and made the most pitiful moans; but could get no assistance: he ran back to his master, then to the public house, till at length a person followed him, extricated the master, and received from the affectionate animal the most grateful acknowledgments.

CANKER, a disease, to which trees are subject; it proceeds principally from the nature of the soil, and causes the bark to decay. If the canker be seated in a bough, and a large one, the general practice is to cut it off at some distance from the stem; if a small one, close to it.

When the tree is thus open and exposed, it is liable to receive injury from the air, moisture and insects. To prevent this, white lead and boiled oil, made into a kind of thick paint, with the addition of sublimate of mercury, has been recommended by Dr. Darwin, as an useful remedy, especially when applied to the wounds of those trees, the wood of which contains less acrimony, and is consequently more liable to be penetrated, and eaten by a large worm or maggot, that would otherwise consume the whole internal wood.

In the 13th vol of the *Transactions of the Society of Arts, &c* the ingenious Mr. Bucknall observes, 'that in pruning, this medication ought never to be omitted, as experience has demonstrated, that mercury removes the noxious effects of canker in the more delicate fruit trees, so effectually, as to influence the vegetation of plants, by affording both smoothness and a free growth to the bark.

He directs every stump, together with the decayed or blighted branches, and all those that cross the infected tree, or where the leaves curl, to be taken off smooth and even; the gum is likewise to be pared down close to the bark, and rather a little within it, but not so as to destroy the rough coat; the fissures, out of which it oozes, are next to be opened to the bottom, the blotches to be cut away, and the canker extirpated: all the wounds are then to be anointed with the medication, a little being smeared over that part of the canker which was not large enough to be cut. The tree must also be scored, and the moss rubbed off; but care should be taken to avoid breaking off a single branch, as this would be productive of dangerous consequences.

"A tree thus managed (says Mr. Bucknall), will, with its remaining free shoots, run large; which as they require a great flow of sap, will keep the roots in constant employ, and thus necessarily establish it in permanent health." He also remarks, that where the sole object is to remove the canker, hog's lard will be found of considerable utility; but if wet also is to be guarded against, it is by no means so beneficial as tar.

There is another method of curing this disease, which has been tried with success; namely, where a branch of a valuable tree is likely to be destroyed by the canker, to inclose the affected part, and some inches above it, in a garden pot of earth, previously divided, supported by stakes, and tied together round the branch, which will then strike roots into the mould, and which, after some months, may be cut off, and planted in the ground: thus preserved, it will produce a new tree.

The general opinion respecting the *cause* of this disease is, that it proceeds chiefly from the nature of the soil. Mr. Forsyth, however, proves from experience, that it originates from the following circumstances, namely: in-

judicious pruning; leaving the foot-stalks of fruit on trees after it has been gathered; bruises arising from the use of ladders in collecting fruit: nailing trees against walls, with too tight trelisses; wet autumns, which prevent the young wood from ripening, and are succeeded by severe frosts that kill the shoots; birds and insects devouring the buds; and, lastly, from carelessly leaving dead shoots on trees, throughout the summer.

From whatever cause the canker may arise, Mr FORSYTH directs all the diseased parts to be cut out, with a draw knife, or any other convenient instrument, and if the inner white bark be infected, this must also be cut away until no appearance of infection remains. The composition must then be applied.

Should any gum be observed to exude after such excision, Mr. F. states it to be a certain criterion, that the canker is not completely extirpated: it will therefore be necessary to repeat the operation as soon as possible; for, if these defects are suffered to remain, the whole tree will be overspread with canker and gum; so that it must speedily perish.

Apple-trees are peculiarly liable to this distemper; in consequence of which their value, together with that of their fruit, is greatly diminished. To prevent the total loss of the trees, Mr DARWIN suggests the ingenious expedient of renovating the diseased bark, by paring its edges to the quick, and carefully adapting a piece of sound bark taken from a healthy tree of inferior value; the whole being secured with a flannel roller, or other elastic bandage.

Doctor DARWIN considers canker as a vegetable gangrene, as it spreads round the trunk or branches, and destroys them. Mr. KNIGHT has observed this disease to be most frequent and fatal to those trees the fruit of which has been long in fashion; as they have been perpetually propagated for a century or two by ingrafting, which he believes to be a continuation of the old tree, though nourished by a new stock. It nevertheless is frequently produced on trees by external violence, as a stroke with a spade by a careless labourer.

CANKER-WORM, a species of insects particularly destructive of corn, grass, and every other vegetable in which it can harbour. It has been erroneously supposed, that excessive and continual wet weather will destroy them, but this is so far from being true, that an instance has occurred of their having been found buried six feet deep in a firm soil.

These worms, every fourth year, become flies, when they deposit their spawn in the ground, and thus produce maggots. Soot has been strewed on the land infested with these vermin, and various other remedies have been tried, but without success; except that practised in the county of Norfolk, where some years since, the canker-worm was particularly pernicious. The expedient alluded to is as follows: when they become flies, and are settled on the trees, especially those of oak, elm, and maple, they are shaken off, so as to drop on pack-sheets, or tilters, spread under them for that purpose. If, in this manner, they are destroyed soon after their first appearance, when in the state of flies, and before they can do farther mischief by lodging on the ground, their numbers will be considerably diminished, and in a few years they will be almost wholly exterminated.

Mr. DEANE says, that the canker worm is produced from the eggs of an earth coloured bug, which having continued under ground, during winter, passes up on the bodies of apple-trees early in the spring. They are hatched early, and destroy the leaves of a tree, and give it the appearance of its having been burnt.

The worms let themselves down by threads in quest of prey, like spiders; by means of which, the wind blows them from tree to tree; so that in a close orchard, not one tree will escape them. But trees which stand singly are seldom infested with these insects. As they are the most pernicious kind of insects with which New England is now infested, if any person could invent some easy, cheap, and effectual method of subduing them, he would merit the thanks of the public, and more especially of every owner of an orchard.

Several methods have been tried with some degree of success: 1. Tarring. A strip of canvas, or linen, is put round the body of a tree, before the ground is open in the spring, and well smeared with tar. The females, in attempting to pass over it, stick fast and perish. But unless the tarring be renewed very frequently it will become hard, and permit the insects to pass safely over it. And renewing the tar in season is too apt to be neglected,

through hurry of business and forgetfulness. If bird-lime were to be had, it might answer the purpose better. 2. Some tie straw round the bodies of the trees. This serves to entangle and retard the insects, and prevents the ascent of many of them But they are so amazingly prolific, that if ever so few of them get up, a tree is ruined, at least for the ensuing season.

The pasturing of swine in an orchard, where it can conveniently be done, I suppose to be an excellent method. With their snouts and their feet, they will destroy many of the insects, before they come out of the ground. And I have never known any orchard, constantly used as a hog-pasture, wholly destroyed, or even made wholly unfruitful by worms. But this method cannot always be taken; and if it could, I do not suppose it would be quite effectual.

There are several experiments I could wish to have tried, for subduing these insects: such as burning brimstone under the trees in a calm time—or piling dry ashes round the roots of trees in the spring—or throwing powdered quick-lime, or soot, over the trees when they are wet—or sprinkling them about the beginning of June, with sea-water, or water in which wormwood, or walnut leaves, have been boiled—or with an infusion of elder, from which I should entertain great hope of success. The liquid may be easily applied to all the parts of a tree by a large wooden syringe.

I should suppose that the best time for making trial of these methods would be soon after the worms are hatched: For at that stage of their existence they are tender, and the more easily killed.

But as tarring the trees is the best antidote that we yet know of, and as many persons of experience believe it is possible that the insects may be thus quite prevented passing up the trees, I shall here give directions how to perform it in the most effectual manner.

In the first place, it is necessary to begin the operation very early in the year. Not observing this caution, has occasioned the want of success which many have complained of: For it is certain that the bugs will begin to pass up as soon as the ground is so much thawed, that they can extricate themselves, which is in some years as early as February. Therefore to make sure work, it is best to begin as soon as the ground is bare of snow in that month, that the first thawing of the ground may not happen before the trees are prepared; for, beginning after ever so few of the insects are gone up, the labour will all be lost.

Another thing to be observed is, to fill the crevices of the bark with clay mortar, before the strip of linen or canvas is put on, that the insects may not find any passages for them under it.

Having put on the strip, which should be at least three inches wide, drawn it close, and strongly fastened the ends together, a thumb-rope of tow should be tied round the tree, close to the lower edge of the strip. The design of doing this is, that the tar may not drip, nor run down on the bark of the tree, which would injure it.

When all the trees of an orchard are thus prepared, let the strips be plentifully smeared with cold tar, put on with a brush. It should be renewed once a day without fail. The best time is soon after sunset; because the insects are wont to pass up in the evening, and the tar will not harden so much in the night as in the day, because of the dampness of the air The daily task must be renewed, and performed with the greatest care, till the latter end of May, or till the time when the hatching of the worms is commonly over, which will be earlier or later, according to the difference of climate.

Another mode of tarring, and which bids fair to be preferred to the foregoing, is as follows. Take two pretty wide pieces of board, plant them, make semicircular notches in each, fitting them to the stem, or body of the tree, and fasten them securely together at the ends, so that the most violent winds and storms may not displace nor stir them. The crevices betwixt the boards and the tree may be easily stopped with rags, or tow Then smear the under sides of the boards with tar. The tar being defended from the direct rays of the sun, will hold its tenacity the longer; and therefore will not need to be so frequently renewed. And the trees may be more secured in this way from the dripping of the tar, as a margin of two or three inches, next to the tree, may be left unsmeared.

Another expedient much recommended, is, to put a strip of raw sheep or lamb skin round the body of each tree, the wool outwards. It is asserted, that though the insects can pass over hair and steaw, they cannot pass over the wool. But, to render this the more effectual, it will be proper to open the

fibres of the wool now and then, with a coarse comb.

When it so happens that the worms are permitted to prevail in an orchard for three years, the limbs will be so corrupted, that the trees are not apt to recover their fruitfulness, although the ascent of the worms should be afterwards prevented. In such a case, it is advisable to cut off all the limbs from the trees, near to the stock where they are produced, that so the tops may be wholly renewed by fresh shoots, as they will be in a few years.

It is not less than about fifty years, since this insect began its depredations in New England, in the parts which have been longest cultivated. But perhaps there is some reason to hope that providence is about to extirpate them: For a kind of little bird has lately made its appearance in some parts of the country, which feeds upon the canker-worms. Should these birds have a rapid increase, the insects will be thinned, so as to be less formidable, if not wholly destroyed.

CANOE, the small boat or primitive ship of simple nations. In all instances, these have generally been found of a construction and magnitude adequate to the undertakings for which they are designed: for it is increasing necessities that enlarge the bounds of science, and multiply the efforts of invention. The materials most at hand have commonly supplied the savage with his bark. In some places, he has formed a basket coated with hides; in others, he has taken a hollow tree for his model —and the Esquimaux have even proceeded to place the ribs of their vessels on stocks, to bend branches to the requisite shape, and cover the whole with the bark of the birch. On the coast of Africa, amid a dangerous surf, the natives travel with incredible swiftness, in canoes easily overset, and as easily righted.

CANON, in church government, a law or rule, either of doctrine or discipline, enacted especially by a council, and confirmed by the authority of the sovereign. The word is also used for the authorised catalogue of the sacred writings.

CANONIZATION, an act of the Romish church, by which it takes upon itself to rank a deceased person among the catalogue of its saints.

CANTATA, a song, or composition, intermixed with recitatives, airs, and different movements, chiefly intended for a single voice, with a thorough bass, though sometimes with other instruments.

CANTEEN, is a small vessel usually made of tinned plate, or wood, in which soldiers, when on their march, or in the field, carry their liquor.

CANTHARIDES, insects used to raise blisters. They differ in their size, shape, and colour: they are of the most brilliant colours. Those who collect them, tie them in a bag or piece of linen cloth, which they hang in the vapour of hot vinegar till the insects are dead The cantharides of Mount Etna are reckoned better than those of Spain.

CANTICLES, the Song of Songs, in the Bible, supposed to be a marriage song written by Solomon, to be explained by compositions of a similar nature in Eastern countries. By other writers it is supposed to be a series of poems, each distinct and independent of the other. By them the canticles are regarded as sacred idyls

CANTO, a song which is used for a division of a poem supposed to make one song, or a portion sung at one time.

CANTON, a small division: hence, in heraldry, a small square, separated from the rest of the coat, is called a *canton*; in military affairs, troops allotted into different quarters or divisions are said to go into *cantonments*; in geography, a small distinct country, such as the Swiss *cantons*.

CANVAS, a coarse sort of cloth, of which there are several kinds Among others, are 1 That worked regularly in little squares as a basis for tapestry 2. That called buckram; 3. The cloth used for pictures; 4. That employed for sails of ships.

CAOUTCHOUC, Elastic Resin, or *India rubber*, is a substance produced from the Syringe Tree, or *Iatropha elastica*, L. which is a native of Guiana and other parts of South America It oozes in the form of vegetable milk, from incisions made in the tree, and is principally collected in wet weather, when it flows abundantly.

[It is soluble by gentle heat in oil of turpentine, and in vitriolic æther, but when precipitated, it does not retain all its original properties.—T. C.]

The caoutchouc is at present chiefly employed by surgeons, for the injection of liquids, and also by painters, and others, for rubbing out pencil marks, &c. though perhaps it may be advantageously used for socks, or even shoes and boots, as well as various useful articles of domestic convenience.

An elastic substance resembling that

imported from South America, is now prepared from the *Caoutchouc Vine*, or *Urceola elastica*, a native of the Prince of Wales's Island, in the East Indies. On wounding the bark of this plant, a milky fluid exudes; which, on exposure to the air, separates into an elastic coagulum, and a watery liquid — The former possesses all the properties of the common India rubber, and may now be procured from Indian Colonies.

CAPELAN, or POOR, *Gadus minutus*, a fish of the cod tribe, which seldom exceeds the length of six or seven inches, and differs from all others of the same tribe by being black in the interior of the abdomen.

It has three dorsal fins, a small beard on the chin, and nine punctures on each side of the lower jaw.

In the Newfoundland fishery these fish are of considerable importance as supplying bait for the taking of cod. They are found in considerable numbers in the Mediterranean, the Baltic, and the North Sea; and wherever they appear, they are a source of great joy to the fishermen, since they are believed to announce an abundant supply of valuable fish, which pursue and prey upon them.

It is stated that in the year 1545, the French coasts in the Mediterranean were visited, for two months, by such myriads of capelans, that many of the inhabitants were obliged to collect together and bury those that were thrown ashore, to prevent any evil consequence of the corruption of so great a mass of animal matter. These fish are sometimes caught on the coast of Cornwall.

They are considered very delicate food, and when salted are peculiarly excellent. A few barrels of salted capelans are occasionally sent from Newfoundland as presents to the friends of the merchants in England, but the fish are too small to be salted there as an article of profit. They are caught both with lines and nets.

CAPER, or *Capparis*, L. an exotic genus of plants comprising seven species, of which the *spinosa*, or common caper only is cultivated in Britain, but with great difficulty. This plant delights in the crevices of rocks, old walls, &c. and thrives luxuriantly in a horizontal direction. In the warm parts of Europe, it is propagated by seeds, and the buds, pickled with vinegar, &c. are annually imported from Italy, or the Mediterranean.

Capers are supposed to excite the appetite, to assist digestion, and to be useful detergents, and aperients, in obstructions of the liver.

Mr JEFFERSON, in a letter to the Committee of Correspondence of the *Agric. Soc. of South Carolina*, dated Paris, July, 1787, recommends the introduction of the caper into the southern states. He observes, "The caper, though a tender plant, is certain in its produce; because a mound of earth of the size of a cucumber hill, thrown over the plant in the autumn, protects it effectually against the cold of the winter. When the danger of frost is over in the spring, they are to be uncovered, and the culture begun. There are a great deal in the neighbourhood of Toulon.—The plants are set about eight feet apart, and yield one year with another about two pounds of capers each, worth on the spot about six-pence *sterling* the pound. They require little culture, and this may be performed either with the plough or hoe. The principal work is the gathering of the fruit, as it forms. Every plant must be picked every other day, from the last of June, until the middle of October. But this is the work of women and children. This plant does well in any kind of soil, which is dry, or even in walls, where there is no soil, and they last the life of a man. Toulon would be the proper port to apply for them."

The seeds must be brought over in their capsules, as they will keep much better than without them: but these should be secured from insects, by wrapping them in tobacco leaves which are well dried: without this precaution, the seeds will be destroyed before they arrive.

CAPILLAIRE.—This pleasant syrup is much used in the West Indies, when mixed with water, to allay thirst, and ought to be generally introduced into this country during warm weather, instead of brandy, or spirits and water.

To make the syrup, put 1 oz. of the leaves of capillaire, (*adiantum pedatum*, or maidenhair) into a pint of boiling water; pour the water off in a minute or two, and after gently stewing them, at least twelve hours, rub them through a sieve, and mix them with sugar prepared in the following manner: Put a pound of sugar into half a pint of water, boil and skim it well, let it boil till upon dipping a silver spoon first into water, and then into the sugar, and into cold water again, the sugar which remains on the spoon may be broken off clear; add to this the water

which the leaves were put into, and put it in an earthen pan over hot coals covered up close—care must be taken to have the heat always equal for three days, and not too great, or it will burn. Take some of this syrup between your fingers, and in drawing them apart, if a thread be formed which cannot be easily broken, it has been sufficiently done; then add the capillaire as before directed, and put it into bottles, which must not be corked till quite cold.

CAPILLARY TUBES, those the diameter of which is scarcely larger than to admit a hair. See HYDROSTATICS.

CAPITAL, in architecture, the uppermost part of a column or pilaster, serving as a head, and placed immediately over the shaft, and under the entablature: it is made differently in the different orders, and is that which principally characterises the orders. See ARCHITECTURE

CAPITALSTOCK, among merchants, bankers, and traders, signifies the sum of money which individuals bring to make up the common stock of a partnership when it is first formed. It is also said of the stock which a merchant at first puts in trade for his account. It likewise signifies the fund of a trading company or corporation, in which sense the word stock is generally added to it. Thus we say 'the capital stock of the bank,' &c. The word capital is opposed to that of profit or gain, though the profit often increases the capital, and becomes of itself part of the capital when joined with the former.

CAPITOL, a famous fort or castle on the Mons Capitolinus at Rome, wherein was a temple dedicated to Jupiter, thence also denominated Capitolinus, in which the Senate anciently assembled; and which still serves as the city hall or town-house, for the meeting of the conservators of the Roman people. It had its name *capitol*, from *caput*, "a man's head;" one having been found fresh and bleeding upon digging the foundation of the temple built in honour of Jupiter. Arnobius adds that the man's name was *Tolus;* whence *caput-tolum.*

CAPRA, the goat, is domesticated in every part of the globe. He resembles the sheep, but is more alert, and possesses more sentiment and intelligence. He is won by kindness, will climb the most steep and terrific precipices. He lives on herbs, but prefers barren heaths to luxurious fields. The Syrian goat is remarkable for its pendulous ears, and is common in various parts of the east. The animals of this species are driven in flocks through the oriental towns every morning and evening, in order to supply the inhabitants with milk.

CAPRIFICATION, a method used in the Levant for ripening the fruit of the domestic fig tree, by means of insects bred in that of the wild fig tree. The caprification of the ancient Greeks and Romans corresponds in every circumstance with what is practised at this day in the Archipelago, and in Italy. These all agree in declaring that the wild fig tree, caprificus, never ripened its fruit; but was absolutely necessary for ripening that of the garden or domestic fig tree, over which husbandmen suspend its branches. The reason of this success has been supposed to be, that by the punctures of these insects the vessels of the fruit are lacerated, and thereby a greater quantity of nutritious juice derived thither. Perhaps too, in depositing their eggs, the gnats leave behind them some sort of liquor proper to ferment gently with the milk of the figs, and to make their flesh tender.

CAPSTAN, in a ship, a large piece of timber, in the nature of a windlass, placed behind the mainmast, used for weighing, or raising up anchors, or any other purpose in which great force is required.

CAPTAIN, a military commander. A *captain in the army* commands a troop of horse, or a company of foot, under a colonel. It is the duty of this officer to superintend the discipline and well being of his men; and he has the power of appointing his own sergeants and corporals. A *captain in the navy* is an officer who commands a ship of the line of battle, or one that carries at least twenty guns. His charge is very extensive; inasmuch as he is answerable not only for the military government, navigation, and equipment of the ship he commands, but also for the conduct of his inferior officers.

CARABINE, a short piece of fire-arms, having a barrel two feet and a half long, carrying a ball of the weight of the 24th of a pound.

CARAT, or CARACT. 1. A weight of four grains. 2. A manner of expressing the fineness of gold; an ounce is divided into twenty-four parts, if of the mingled mass two or three or four parts out of four and twenty be base metal, the whole is said to be 22, 21, or 20 carats fine.

CARAVAN, or KARAVANNE, a company of travellers and pilgrims, and more

particularly of merchants, who, for their greater security, and in order to assist each other, march in a body through the deserts and other dangerous places, which are infested with Arabs or robbers.

CARAVANSERA, a sort of inn, the erection of which is generally an act of charity among the Mahometans It commonly consists of a large square court, surrounded by piazzas, under which, supplied with a resting place, and secure from robbers, man and beast take up their lodging for the night In the upper part, there are generally private apartments, the use of which is costly.

CARAWAY, the Common, or *Carum carui*, L. is an indigenous biennial plant, propagated from seeds, which ought to be sown in autumn; it blows in the second year, and decays a short time after the seeds are ripe. This plant furnishes a wholesome and agreeable food to goats, swine and sheep, but is refused by cows and horses The young roots are said to be more delicious than parsnips, and the tender leaves may be boiled with herbs.

BECHSTEIN asserts, that caraway, if carefully transplanted into a richer soil, produces roots not inferior to those of the scorzonera, both in taste and utility · they also afford a very agreeable pickle, which preserved in vinegar, sugar, &c

On account of their aromatic smell, and warm, pungent taste, the seeds of caraway may be classed among the finest stomachics and carminatives of our climate. To persons afflicted with flatulency, they generally afford considerable relief.

Caraway seeds, when finely pounded, spread on bread and butter, with a small quantity of ginger and salt, and eaten every morning and evening, have been found to be an excellent remedy against hysterics; unless this complaint arise from improper diet. acrid humours, bile, passion, &c· They are likewise used in cakes, and, when incrusted with sugar, are called caraway comfits. Besides these multifarious purposes, caraway-seeds are distilled with spirituous liquors, on account of their flavour; but they produce a noxious, heating oil, which renders those liquors far more pernicious to health, than they are even in a pure state.

CARBON, or pure charcoal, the radical of carbonic acid, is a term introduced by the French chemists to denote the pure or essential part of charcoal. Though this substance abounds throughout the vegetable kingdom, and is also contained in animal and even mineral bodies, yet it is very rarely to be met with in a state of absolute purity; it is indeed remarkable, and would be almost incredible, if the results of modern chemistry did not render it indisputable, that the most valuable of all the gems, the diamond, is nothing but pure crystallised carbon. For many ages the diamond was considered as incombustible; and NEWTON was the first person who conjecturnd, from its great refractive power, that it was capable of combustion. This conjecture was verified before the death of that illustrious man, by the members of the Academy Del Cimento at Florence, who, in 1691, consumed several diamonds, by placing them in the focus of a burning lens. Other philosophers repeated the experiment with the heat of a furnace : and the nature of the diamond was at length ascertained by the successive attempts of LAVOISIER, MORVEAU, and TENNANT. Carbon, in the state of diamond, is transparent, crystallised, intensely hard, and perfectly colourless. In oxygen gas it burns with great heat, like other combustible bodies, attracting the oxygen, and at length is wholly converted into carbonic acid gas. Carbon combines with iron, and converts it into steel: it may be united with sulphur, copper, &c. forming with them carburets of sulphur, copper, &c. Steel is a carburet of iron, so is black lead as it is called: the proportions of carbon differ in each substance.

The properties of charcoal are the same, from whatever wood, it may be made. One of the most singular of these is, that it is not liable to decay by age. Hence it was customary with the ancients to char or burn the outside of stakes, or other wood, which were to be driven into the ground, or placed in water. It may be preserved without injury for an almost indefinite length of time; and in the ancient tombs of the inhabitants of northern nations, entire pieces of charcoal are at this day frequently discovered.

Besides the great use of charcoal in the composition of gunpowder, and to artists and manufacturers of different kinds, it has lately been employed with considerable success in correcting the rancid and disagreeable smell of train oil, so as to render it fit to be burnt in chamber lamps, and several manufactories of this oil have lately

been established in the neighbourhood of London. Newly-made charcoal, if rolled up in clothes which have contracted a disagreeable odour, will effectually destroy it: and if boiled with meat beginning to putrefy, will take away the taint.

This substance is used by artists in the polishing of brass and copper plates, for the drawing of outlines, and numerous other purposes. When purified it forms perhaps the best tooth-powder that is known. The mode of doing this is to reduce it to powder, wash it repeatedly with pure water, and then dry it by means of a strong heat in close vessels. This heat expels the foreign contents with which it is impregnated; but however intense, if the vessels are closed, it in no respect alters the quality of the charcoal.

The vapour of burning charcoal is extremely pernicious; and persons exposed to it in confined rooms are sometimes destroyed in a very short time. The best remedy is immediately to take them into the strongest draft of cold air that can be obtained, to loose all their garments, and apply volatile spirits to their nostrils.

CARBONIC ACID is a compound of oxygen and carbon, or pure charcoal; and in a state of gas forms a constituent part of the air which we breathe. It is also emitted in great abundance from wine, beer and other liquors in a state of fermentation, and is sometimes found in the lower parts of mines, where it is known to the miners by the name of *choke damp*, from the circumstance of its immediately extinguishing flame, and suffocating all animals that are immersed in it. This gas, which was formerly called by the chemists *fixed air*, is about twice the weight of common air. In combination with lime it forms chalk, marble, and limestone; and it constitutes a part of other mineral substances, which are thence denominated *carbonates*.

In order to obtain this gas, it is only necessary to dilute with water a quantity of chalk, which is a compound of carbonic acid and lime, and to pour spirit of vitriol upon it. Carbonic acid issues from the effervescence in a state of gas, and may be received into vessels made for the purpose, in the manner of other gases. On account of its great weight, it is capable of being contained in open glass vessels without evaporating; and though invisible, like common air, may be poured from one vessel into another, in the same manner as water. It may even be dipped out in a pitcher or bottle, and, if well corked, may be conveyed to a great distance. It occupies the open space of vessels where the fermenting process is going on; and a great variety of entertaining experiments may be made in this stratum of elastic fluid. Lighted paper, or a candle, dipped into it, is immediately extinguished, and the smoke remaining in the gas render its surface visible. This, by agitation, may be thrown into waves, which have a very pleasing effect. If a dish of water be immersed in this air, and briskly agitated, it soon becomes impregnated, and has the taste of Pyrmont water. If a lighted candle be placed at the bottom of a vessel, and carbonic acid gas be poured upon it, it will soon be extinguished, although the eye is incapable of perceiving any thing thus poured out, and producing these effects

CARBONIC OXYDE or gaseous oxyde of carbon, is compounded also of carbon and oxygen, but with a less proportion of the latter than is necessary to constitute an acid.

CARBUNCLE, in natural history, a very elegant gem, whose colour is deep red, with an admixture of scarlet. It has yet been found only in the East Indies, and there but very rarely? A garnet.

CARDAMOM, or *Cardamomum*, a species of the *Amomum*, is a native of India, comprehending two varieties. 1. The *majus* or greater cardamom, which, when it arrives in England, is a dried fruit, or pod, about an inch long, and contains two rows of small triangular seeds, of a warm aromatic flavour. 2. The *minus*, or lesser cardamom, a fruit of an inferior size to that of the preceding variety, but considerably stronger, both in smell and taste.

The cardamom is, in this country, only known by its seeds, which are sometimes usefully employed in colds, flatulency, colics, and in laxity and debility of the intestines Its seeds are said to possess this advantage over those of the pepper species, that notwithstanding their pungency, they do not immoderately heat or inflame the bowels.

CARDINAL, which, in a general sense, and as an epithet, signifies principal or pre eminent, is formed of the Latin word *cardo*, a hinge, agreeably with the common expression, in which it is said of an important matter, that every thing *turns* upon it: thus Justice, Prudence, Temperance, and Fortitude are called the four cardinal virtues. The

cardinal signs, in astronomy, are Aries, Libra, Cancer, and Capricorn. The cardinal points of the compass, north, south, east, and west.

CARDOON (*Cynara cardunculus*), a species of artichoke which grows wild in the south of France, and has smaller flowers than the common artichoke, and the scales of the calyx terminated by long sharp spines.

The stems rise to the height of four or five feet, and are upright, thick, and cottony. The leaves are large and winged, and the flowers of blue colour.

The parts of the cardoon that are eaten are not those belonging immediately to the flower, as of the artichoke, but the roots, stalks, and middle ribs of the leaves; and chiefly the latter, which are thick and crisp. But as all these are naturally very bitter, the plants are blanched, by being tied up like lettuces, about the month of September, and having earth thrown upon their lower parts, to the depth of eighteen inches or two feet. Cardoons come into season for the table about the end of November, and are either eaten alone, or as a sauce to animal food, particularly roast meat; or are introduced as a dish in the second course. They are, however, not so much used in England as on the continent; and this in consequence, chiefly of the trouble attending their cultivation, and their preparation for the table so as to render them palatable.

CARDS, were invented about the year 1390, to divert Charles VI. of France, who had fallen into a melancholy disposition. The inventor proposed, by the figures of the four suits, or colours, as the French call them, to represent the four classes of men in the kingdom. By the *cœurs* (hearts) are meant the *gens de chœur*, choir-men, or ecclesiastics; and therefore the Spaniards, who certainly received the use of cards from the French, have *copas*, or chalices, instead of hearts. The nobility, or prime military part of the kingdom, are represented by the ends or points of lances or pikes: the Spaniards have *espadas*, swords, in lieu of pikes; and hence we call them spades. By diamonds are designed the order of citizens, merchants, or tradesmen, *carreaux* (square stones, tiles, or the like) —the Spaniards have a coin (*deniro*) which answers to it; and the Dutch use the word *streneen* (stones or diamonds), on account of the form of what is here called *carreaux* by the French. Trefle, the trefoil-leaf, or clover-grass (corruptly called *clubs*), alludes to the husbandmen and peasants. The Spaniards appear to have substituted *bastos* (staves or clubs), and we too have given the Spanish name to the French figure. The four kings, which the French, in drollery, sometimes call the *cards*, are David, Alexander, Cæsar, and Charles; which names were, and still are, on the French cards. The first three of these names represent the celebrated monarchies of the Jews, Greeks, and Romans, and the last that of the Franks, under Charlemagne. By the queens are intended Argine, Esther, Judith, and Pallas (names retained in the French cards) typical of birth, piety, fortitude, and wisdom, the qualifications severally attributed to the persons named — Argine is an anagram for *regina*, a queen by descent. By the knaves were intended the servants of knights (*knave* originally meaning a *servant*); but pages and valets, now indiscriminately used by various orders of persons, were formerly only allowed to men of quality, under the names of esquires (*escuires*, shield or armour-bearers.)

CAREENING, in sea-language, the bringing a ship to lie down on one side, in order to trim and caulk the other.

CARILLONS, a species of chimes frequent in the Low Countries, particularly at Ghent and Antwerp, and played on a number of bells in a belfrey, forming a complete series or scale of tones or semitones, like those of the harpsichord and organ.

CARMINE, a powder of a very beautiful red colour, partaking of the shades of scarlet and purple. It is used by painters in miniature; but, on account of its high price, they are often induced to substitute lake. The manner of producing it is preserved a secret by colour-makers; and, though many recipes have been published, none has ever been found to answer the purpose.

The following process, however, we shall communicate on the authority of the *Gentleman's Magazine*, for 1753, in which it is asserted, that this costly article may be made, even in greater perfection than that produced by the French artists: Take four or five gallons of pure water, and dissolve in it a sufficient quantity of soda to make a strong ley. After having filtered the solution, put it in a brass pot, and boil in it one pound of the clean shreds of scarlet cloth dyed in grain, till they

have totally lost their colour; then squeeze the shreds, and pass all the ley through a flannel bag. Dissolve two pounds of alum in a proper quantity of water, and add this solution to the ley; stir them well together, and the whole will become rather thick; it is then to be repressed through the flannel bag, and the liquor will run out clear; but if it be at all tinged, it is again to be boiled, with the addition of a small quantity of dissolved alum, passed through the bag a third time, and all the carmine will be left behind. Fresh water is then to be poured repeatedly into the bag, till all the alum is washed away; when the colour must be dried, so as to prevent any dust from settling on it, and may then be kept for use, being previously reduced to an impalpable powder in a glass or marble. If, however, in the boiling, so much water evaporate, as to require an addition, care must be taken to add only boiling water to supply the deficiency.

[This is not carmine, but safflower, or the pink colour of the carthamus, used for dyeing pink.* For carmine take good cochineal in powder and put it in fine muslin bags: let it digest for several hours in hot but not boiling water. Make a weak solution of alum that contains no iron: precipitate the cochineal liquor: wash the precipitate, and then pour on it a dilute solution of tin in the nitro muriatic acid. Wash it again and let it subside.—T C.]

CARNELIAN, a precious stone, either red, yellow, or white. The finest carnelians are those of the East Indies: there are some beautiful ones in the rivers of Silesia and Bohemia; and some of a quality not to be despised in Britain. The use to which they are most generally applied is that of seals.

CARNIVAL, a period previous to Lent, celebrated with great spirit throughout Italy, and during which feasts, balls, operas, concerts, intrigues, marriages, &c. abound. The churches are filled with choristers, and the streets with masks. This festival flourishes more particularly at Venice, where it begins on the second holiday in Christmas, and where it boasts to have had at one time seven sovereign princes and thirty thousand foreigners among its votaries.

CARNIVOROUS ANIMALS are those which seek for, and feed on, flesh. Man is naturally carnivorous, for we are furnished with teeth necessary for the mastication of every kind of food, whence it may reasonably be inferred, that Nature has kindly intended, both the vegetable and animal kingdoms, for the sustenance of mankind.

* The bastard saffron of Pennsylvania.

CARP, or *Carpio*, L. is a species of the *Cyprinus*, a genus of fish comprising above thirty species. Carp are also called white-fish, on account of their glittering scales, and are distinguished from other fish, by having no teeth, the want of which is supplied by several small rough bones fixed in their throat. They were introduced into England during the 16th century.

These fish are much celebrated for their longevity, many of them attaining an age of from 60 to 100 years,† and growing to the extraordinary length of six feet. They delight in muddy ponds, which are well sheltered from the wind, and into which should be thrown the liquor from cattle-yards, mixed with clay, peas, beans, oil-cake, &c. In order to fatten them, and increase their size, the growth of grass under the water should be particularly attended to; as they principally feed on it during the summer months. To effect this, when the water decreases in summer, the dry naked sides of the pond should be raked, and grass-seeds abundantly sown: these will produce a plentiful supply of herbage, which, when the pond [illegible] up by rains, affords a [illegible] place, where the fish will [illegible] fatten. In the winter, they crowd together in the mire under the ice, which should be occasionally opened to admit air, for want of which the carp is often severely affected. But where it is practicable, part of the water should be drawn off, which will be more beneficial to the fish, than to penetrate the ice. This should also be done, when the pond has been struck by lightning, or when the fish are sick, which sometimes happens, if the water become foul or turbid.

Carp are much celebrated for their docility, and have been known to be so tame, as to swim to the shore, and take their food, on being called, or summoned by the sound of a bell. In general, however, they are extremely cunning, and difficult to be caught, except during the time of spawning. The best season for catching carp and barbel, is the month of July, and the most proper time, at day-break. Care must be taken to use neither lead nor

† In the fish ponds at Chantilly, a carp was recognised upwards of 100 years old.—T. C.

shot in the lines; which ought to be proportionate to the length of the rods, and made of Indian twist, or strong pearl-coloured silk, armed at the bottom links with sea-grass, Turkey-grass, or strong silk-worm gut, perfectly free from knots or frettings.

When the spot for angling is fixed upon, it is requisite, on the preceding night, to throw in a considerable quantity of paste, prepared of bread and bran, or mixed with lob-worms cut to pieces This purpose may also be effected by throwing in a mixture of blood and grains, which must be repeated three successive nights; the spot being marked with particular attention. In the dawn of the morning, after the depth has been plumbed with the greatest exactness, the bait for the first rod, which is to lie at the bottom, should be a well scoured lob-worm, and the hook must be passed through its body, about three inches from the tail; that part being more agreeable to the fish than the head An additional ground-bait should be thrown in, at the same place, on the three preceding nights. The worm being dropped as exactly as possible on the ground bait just thrown in, the first rod is to be laid on the ground, and the second baited. The bait for this rod must be four red worms, properly cleansed and pierced through the head. The third rod ought to be baited with a paste prepared of the following materials: the crumb of white bread one day old, soaked in warm milk, till it has imbibed enough to make it of the necessary consistence; when the milk is to be pressed out, and a sufficient quantity of honey added, to impart to it a sweet flavour A little saffron, well dried and powdered, must also be mixed, together with a few drops of oil of rhodium, in order to tinge it of an orange colour. It is then fit for immediate use; but care must be taken, that the floats for each rod be of the short single-plugged kind, and that the fish "be played deep;" as, if this caution be neglected, the fish will "break," and make its escape.

Carp are much esteemed for their delicacy and flavour, which may be greatly improved by keeping them in river water for a few days before they are eaten. Their gall is in much repute among the Turks, for staining paper; and also for making a fine sap-green colour ?

Formerly, it was erroneously believed, that the frequent eating of this fish proved a certain remedy for dimness of sight; and, with that view, many persons used it as their daily food.

Carp is the most valuable of the finny tribe, for stocking ponds, on account of its speedy growth, and uncommonly rapid increase. The most proper situations for *carp-ponds*, are those surrounded by rich pastures, or corn-fields, having soft springs on the spot, or being at least in the vicinity of pure running water · they should be exposed to the sun, and sheltered from the easterly and northerly winds.

Those persons who propose to breed carp on a large scale, ought, in the opinion of the Hon. ROGER NORTH, to be provided with three reservoirs, namely: 1. A *spawning-pond*, which should be cleared of all rapacious fish, and other animals; 2. A *nursery*, intended for the reception of the young carp, which should be removed from the spawning pond, in the month of March or April, and, 3. The *main-pond*, which is designed for such fish as exceed 12 inches in length.

The best carp for breeding, are those from five to seven years old, with long bodies, fine full eyes and scales, without any blemish or wound: three or four such male fish, with six or eight females, will be sufficient to stock a pond one acre in extent; they should be conveyed thither on a fine calm day, toward the end of March, or early in April. One thousand, or twelve hundred, young fish may conveniently inhabit a nursery of a similar capacity; but, when they are first put in, it will be necessary to watch and drive them away from the sides, lest they become the prey of rapacious birds. The most favourable seasons for stocking main-ponds, are the spring and autumn; when a space, of 15 square feet (perhaps four cubic feet,) will be sufficient for each carp: the growth of the fish depends on the room, and quantity of food allowed them.

The winter seasons sometimes prove so severe, that the water freezes as often as the ice is broken for the admission of air; in consequence of which the carp frequently perish. In such case, the fish may be preserved in a cellar, by the following expedient: Let each be enveloped in wet moss laid on a piece of net, and then be secured in a purse, so as to admit the air. The net must be immersed in water, at first every third or fourth hour, and suspended to the ceiling, though after-

wards such dipping may be performed once in six or seven hours. Their food ought to consist of bread, soaked in milk, which should be given in small quantities, and gradually increased, as the animal becomes accustomed to this mode of living. By such treatment many fish have been preserved alive for a considerable time, and have even grown fat, so as to become more fit for the table.

[Carp of from 3 to 6 lbs. weight accompany the shoals of shad in our American rivers in the spring of the year. They are caught in the proportion of about one carp to 200 shad: they will not answer for salting, but when stewed with a little gravy, wine, and ketchup, form one of the most palatable dishes that fish may afford. They are the principal ingredient in the French national dish, the matelot.—T. C.]

CARPET, a covering for floors, &c. manufactured of wool, or other materials, and worked with the needle, or in a loom. The carpets in the greatest estimation are those of Persia and Turkey; but a manufactory has been established at Paris, where they are made in the same manner as the true Persian carpets, to which they are little inferior. There is also a good sort made in Germany; these are often embellished with silk, and some are even made of dog's hair. In England, carpets are manufactured of a superior quality; the most elegant and valuable of which are those known by the name of *Brussels*.

[The method of working up old woollen, and the listing of woollen cloth, into what are called rag carpets, is an article of domestic economy worth attending to. It is now and then required to dye uncoloured rags of various colours; for this purpose I insert the following short directions here, for the use of the back-country home manufacture.

Yellow. Three ounces of alum, two pounds of the inner bark of the black oak, or of hickory, or of golden rod, to the pound weight of woollen. Dissolve the bruised alum in boiling water, in a wooden vessel, and let the rags soak in it for three or four hours; the quantity of water proportioned to the quantity of cloth; about as much as will soak them conveniently: then take them out, wring them, till they are just moist and no more, and throw them into the dye liquor. The woods should be boiled for an hour in a tin, copper, or brass vessel: iron is apt to deaden the colour: take out the wood or bark with a sieve before you throw in the cloth: let the cloth remain in for an hour: take it out; press it till it be just moist, throw it into the hot alum liquor, and let it stay an hour: mean while return the bark into the dye-kettle and boil it again: then put in the rags again after pressing out all the alum liquor so that they are just moist and no more. Repeat this with some fresh bark, if the colour is not deep enough. Wash them well in water and dry them.

Red. Alum 3 ounces to the pound of rags; madder ⅜ths of a pound; brazilletto or peach wood ⅛th of a pound: proceed as with yellow. All farmers, from New York state to Georgia, should grow their own madder.

Blue. No blue will stand but that of the blue dyer. If you cannot send to a blue dyer, the easiest method is to put a couple of ounces of indigo ground *very fine*, which is essential, into about four gallons or more of urine: as soon as the urine begins to putrify, the indigo begins to dissolve, but not before. When you find it dissolved, and of a green colour, dye the woollen in it.

But an easier blue is this: in 7 ounces of the strongest colourless oil of vitriol, dissolve one ounce of indigo ground into an extremely fine powder. Stir the mixture with a glass rod or the shank of a tobacco pipe; in a day or two the indigo will be dissolved. Dilute it according to your colour. Wash the goods afterward, with great care, in water three or four times: then in water containing ½ an oz. of pot or pearl-ash to the gallon; then rinse.

Green. Dye the yellow rags in the blue liquor.

Orange. Mix a little madder with the yellow dye. The dye with annatto will not stand the sun and air.

Buff. Dip the rags in a hot liquor made by dissolving 4 ounces of green vitriol (sulphate of iron) to the pound of rags; then wring them till they are just moist: then dip them in lime water, which, if the lime be good, is just as good as ley. They will be green at first: open them to the air till they become yellow; then and not before, wash off the lime; dip them again in the first liquor; wring them, and throw them again into the lime water. Repeat till you have gotten your colour.

Olive. Proceed as in dyeing yellow, only instead of three ounces of alum to the pound of rags, use two ounces of alum and half an ounce of green vitriol

Black. If your black rags are rusty, or not deep enough in colour, boil them in a liquor coloured by ¼ of a pound of logwood, and half an ounce of verdigris to the pound of rags.—T. C.]

CARRIAGE, a vehicle which is employed in conveying persons, goods, merchandise, &c from one place to another, and is usually constructed with two or four wheels.

Carriages have various names, which together with their structure, are so generally known, as to render any description of them unnecessary. From their great utility, more particularly when applied to the purposes of family convenience, they have excited the attention of the most ingenious artisans, who have sedulously studied to improve them. Hence a variety of experiments have been made, in order to ascertain the best, and most proper mode of constructing them, and preventing the different obstacles, which tend to impede their motion To discuss these, would be to embark into too wide a field of enquiry into the principles of mechanics, and to deviate from that plan of conciseness we have adopted Those of our readers, who may be desirous of acquiring minute information on this subject, will be gratified by a perusal of Mr. ANSTICE's *Remarks on Wheel Carriages*, 1789, 8vo. in which it is fully and ingeniously investigated; and the [illegible] constructing wheel-carriages are laid down, according to the strictest principles of mechanics.

In August, 1800, a patent was granted to Mr ISAAC HADLEY REDDELL, for a new method of constructing carriages, intended to convey merchandise, either by land or by water; and which may be removed (whether loaded or unladen) from the water to the land, and *vice versa*, with ease, expedition, and safety. The patentee makes the bodies of any size or shape required principally of wood; but, to strengthen, and render the different parts water-tight, they are connected with iron, or other suitable material. A proper number of wheels are next affixed either in recesses or in narrow boxes or compartments, that are so constructed as to resist the water: these wheels are farther so arranged, that the bottom of the carriages be not more than six, nor less than three inches, above the ground. When in the water, the carriages thus adjusted, may be fastened together, and drawn by one horse; but, in the contrary case, it becomes necessary to separate them, and draw them up an inclined plane. A more particular description of this curious contrivance, is in the 14th vol. of the *Repertory of Arts*, &c.

In the year 1800, the society for the *Encouragement of Arts*, &c. conferred a bounty of thirty guineas on Mr GEORGE DAVIS, for his invention, calculated to prevent passengers in carriages from being injured, when horses have taken fright. As a mere verbal account would not convey an adequate idea of this useful machinery, we are under the necessity of referring the reader to the 18th vol of the *Transactions of the Society for the Encouragement of Arts, &c.* where the whole is illustrated with an engraving. Let it suffice to remark, that the apparatus is fixed behind the splinter-bar of a carriage; and the communication is, by means of a copper chain, carried through the [illegible] to the side of the coach-box; so that, in case the horses take fright, or the reins break, the coachman can discharge the animals instantaneously. An advantage peculiar to this contrivance is, that the *horses can be liberated even when the poles are at right angles, or are locked close to the perch; a position which otherwise overturns a carriage.* Mr DAVIS's invention has been exhibited with complete success, in the presence of a Committee of the Society, and many other respectable spectators: but, as apprehension was entertained that passengers might suffer injury from the motion of the carriage, *after* the horses were disengaged, Mr. D has added a *gripe* for stopping the wheels; so that, by one pull of the chain, the animals may be discharged, and two bolts be propelled on the nave of the two fore-wheels, in such manner as effectually to retard their motion

[*It is ascertained* that one man on [illegible]ably good turnpike roads, can conveniently drive and take care of four horses in four single horse carts; which will convey with ease a greater weight than can be put in a six horse wagon. No wagons with more than four horses ought to be permitted on the *best* turnpike.

In this country I know of no improvement so promising as *turnpike-roads*. We are at length alive, not merely to their utility, but their absolute necessity But I will venture to predict, that the system of turnpikes will fall into discredit, unless they are so made and so managed, as to become profitable to the subscribers, as well as useful to the

community. Would our legislators do as they ought to do—would they do that which individuals cannot do, and which the public good absolutely requires to be done—would they make the roads themselves and exact a reasonable toll for the use of the public treasury, rendered certain by farming out the tolls by public auction, it would be of no consequence whether this toll would pay interest for the money expended or not, for what the treasury would lose, the public would gain. But if roads are to be made by individual subscription, they must either pay at least common interest, or subscribers will not hazard the necessary capital.

There are two sources of loss to the subscribers to turnpike roads, that require particularly to be guarded against. 1. Unnecessary expense in making the road in the first instance; and 2 The ruinous waste and tear of the road when made, by means of *great weights on narrow wheels*. No road, of whatever materials made, no reasonable toll, can stand against this last source of enormous expense, which threatens annihilation in the end, to the greatest internal improvement this country has yet known. In England, they are well aware of this evil by dear bought experience, and have taken great pains to provide against it. In that country they have gone near to abolish four inch wheels to wagons, and have made it the interest of carriers to use tire of six and still oftener of nine inches. The tolls are in a compound ratio of the number of horses and the narrowness of the tire In this country some such regulation must be adopted ere long, or adieu to the system.

In England however, they have found out of late years, that large wagons holding great weights and drawn by many horses, *are not* the most profitable mode of conveyance, but that single horse carts are to every intent and purpose on their turnpike roads much the cheapest They find by experience that two horses in two carts on a good road will draw more than three horses in one cart. I say on a good road, reasonably so: for doubtless if the road be in such a condition that one horse in places can scarcely move an empty cart, a carrier must employ a team adequate to overcome the obstacles arising from the road being out of repair. The following facts then, are to be taken as relating to roads kept in tolerable good order: the better the road, the more strongly they apply. I have so strong an impression of the importance of this subject, both in a national and individual point of view, that I have accumulated dissertations and heaped testimony upon testimony, that all doubt may be removed, as to the *practical* superiority of one horse teams But as the passages are too long for insertion here, I refer to 18 Ann of Agr. 178. 23 Ann of Agr. 22* to 24*. Same vol. p 404, 405. 27 Ann. of Agr. 337, 338, 339 29 Ann. of Agr 142, 143, 144 16 Rep Arts. *Old Ser* 49—T. C.]

[*Best mode of avoiding the fatal accidents of open carriages*—Jumping out is particularly dangerous, (the motion of the gig communicating a different one to the one you give yourself by jumping,) which tends very much to throw you on your side or head; many suppose it very easy to jump a little forward, and alight safe; 'tis a supposition; they will not find it so on trial The method of getting out behind the carriage is the most safe of any, it having been often tried when the horse has been going very fast See 15 Nich Jour —T. C.]

CARROT, or *Daucus*, L. a genus of plants comprising ten species, of which the *Carota*, or common carrot, only is cultivated in Britain, where it was introduced from Flanders, in the reign of Queen ELIZABETH.

Carrots are propagated from seeds, which may be sown at different times, during the whole season; in order to procure a succession of young roots for the table. They require an open situation, at a little distance from a wall; the seeds should be previously rubbed between the hands, to take off their beards, as they will otherwise adhere to each other, aud come up in patches; but if sown close under the wall, they will too quickly run up to seed, and produce indifferent roots These plants delight in a warm, light, sandy loam, which should be dug to a considerable depth, to facilitate the roots striking downwards, as they are apt to become forked, and to shoot out lateral branches. They grow most luxuriantly after turnips, which render the land more clear of weeds than it is found after any other crop. As a culinary article, the carrot is well known; it also furnishes a wholesome and nutritious fodder for cows: if given to them in the winter, and early in the spring, it greatly increases their milk, and imparts to it an agreeable flavour Hogs thrive well on carrots, which they

fondly eat, when boiled in their wash. A sparing allowance of these roots, besides the usual food, is said to produce an invigorating effect on hunters: plough and cart horses also eat them with avidity; and while thus fed require no corn, and very little hay. Oxen and sheep fatten very speedily on carrots; and, if the latter animals are "half fat," when put up, they will be completely so, in about three months.

Although carrots, when left in the ground, will not endure the severity of winter, like cabbages and other vegetables, yet, by proper care, they may be preserved, so as to afford a wholesome and strengthening fodder for cattle. The method alluded to, is amply described in the eleventh volume of the *Annals of Agriculture*, from which we extract the following account: Soon after Michaelmas, when the weather is dry, the carrots are dug out, and piled up on a bank of earth, raised about six inches above the level of the soil, and proportioned to the quantity of carrots intended to be preserved. On this bank is spread a thin layer of straw, on which the carrots are placed, with their tops turned outward, and the ends folding one over another. The small roots are topt, and laid in the middle, to prevent the two sides from separating, by the greater pressure of weight on the centre. Every second or third row is covered with a little dry straw, and the stacking thus continued, till it reaches to the height of about four feet, when an additional quantity of dry straw is carefully spread over the tops, and the whole is thatched with sedge. Another line is then commenced in the same manner as the preceding, and sufficient room left for one person to pass between them. The intermediate space is next filled up with dry straw, and the outside defended with bundles of the same material, staked down, or fastened with hurdles. Thus secured, carrots will protect themselves from frost, by their own tops, and ensure a constant supply of fodder, at a period when almost every other vegetable is destroyed.

Upon a gravelly soil on a hill, Major Spooner, of Roxbury, Massachusetts, sowed carrot-seed in a furrow made by the plough, leaving a space of two feet between the furrows. On the 15th June, the sowing was completed. The carrots were neglected until buried in weeds, and a severe drought succeeded. On the 15th July, the patch was ploughed and weeded: on the 1st of August, between five and six hundred cabbages were transplanted in the spaces left.

The necessary hoeing for those, kept the carrots also in tolerable order. In the autumn, they proved to be of the middle size of garden carrots. After cutting the tops, the whole produce measured forty bushels. Mr. Ford is of opinion, that in common fields, with the usual proportion of manure, the average produce would be twenty bushels per acre. If this be the fact, no husbandry will keep so many head of cattle on a given quantity of land, and at so little expense.

Mr. Dean says, "a sandy soil is very proper for carrots; but they do very well in gravelly and loamy soils, when loosened to a sufficient depth.* The ground should be ploughed or dug more than twelve inches deep, and well pulverised.

I have found by long experience that carrots should be sowed early. The last week in April in England, is late enough; and they may be sowed earlier, if the ground be in good order, and so dry as to be made light and loose. The earliest sown will be the largest, and nearly as tender and good tasted as if sown later.

The field culture of this root begins to prevail, for carrots are found to be valuable for feeding not only swine, but horses† and cattle, and for fattening them. They are so easily cultivated, and so hardy, that they may be raised in fields. They will grow well in a soil that is but moderately rich. if it be ploughed deep, and made mellow. And there is no difficulty in keeping them through the winter, in good order for feeding cattle. The ground should be ploughed in the fall preceding, and ploughed very deep. If the plough do not go deep enough at once, it should be trench ploughed: that is, the plough should pass twice in the furrow. And if some of the earth which was never before stirred, should

* [This is not so. They should be confined to light soils only, ploughed very deep. Three measures of light sand should be well mixed with one measure of the seed when sown broad-cast. They are a most valuable crop.—T. C.]

† [I have tried them extensively for horses, who prefer them often to oats. I have *repeatedly seen this*. They give a horse a fine coat, and are decidedly the best food for broken winded horses, and as I believe for asthmatic men.—T. C.]

be thrown up to the surface, it will be no damage, provided it be such earth as crumbles easily, and does not remain in lumps, after the winter frosts.

If the land incline to much wetness, it should be water-furrowed, after ploughing, that so it may be dry, and fit to be ploughed again very early in the spring. It must be well harrowed before sowing, first with a heavy harrow, and afterwards with a lighter one, with shorter teeth placed near together. After the seed is sown, the ground should be raked When sown in the broad-cast method, they should stand so far apart after thinning, as to have each half a foot of soil. There will be no danger in thinning them early, as they are a plant which is seldom diminished by insects.

After the first hoeing, the European farmers harrow them. It is said not one in fifty will be destroyed by the operation. It will loosen the soil, and greatly forward their growth. But it will be advisable to go among them after harrowing, and uncover those which are buried under heaps of mould. A Mr Billing, in England, one year sowed thirty acres of carrots, and had an extraordinary crop. Some of the best of the land yielded him twenty-four cart loads per acre. If his cart contained 40 bushels, which is a common size in this country, he had 960 bushels from an acre. And this is not a greater crop, than a gentleman at Newbury had last year, unless I am misinformed.

Mr. Billing had 640 loads of carrots per 30 acres, which he thinks equal in use and effect to near 1000 loads of turnips, or three hundred loads of hay. If so, he had as good a crop as ten loads of hay per acre would have been. But the half of this quantity is seldom if ever obtained in hay; or if it were, it must be very coarse, and not near so valuable as hay in general.

This farmer found, that his carrots answered extremely well, not only for fattening swine, but bullocks; and for feeding milch cows, sheep and horses; and that the land was left in a better condition for a succeeding crop, than land after a crop of turnips.

It is with pleasure that I find the attention of some of my countrymen turned to the field culture of this excellent root. They who have but little land may probably enable themselves to keep considerable stocks by means of it

This root has greatly the advantage of turnips, not only in its being a richer and more nourishing food, and in yielding a larger produce, but also in its being never annoyed or hurt by insects. This crop, rightly managed, I have never known to fail, as it is well known the other often does.

The drill method is preferred by some, but the labour will be increased. The seeds must be sown by hand, as their shape will not admit of their being drilled. To prepare them for sowing at all, they should be well *rubbed*, and *passed* through a *sieve*.* The first hoeing of carrots in rows must be also by hand; at which hoeing they should be thinned to one or two inches asunder, if large ones are desired.* It is not amiss, if they grow large and rank, when they are chiefly designed as food for cattle, though small sized ones are preferred for the table. The way to keep carrots good for eating through the winter, is to bury them in dry sand of the yellow kind from pits."

Various, but unsuccessful, experiments have been made to prepare sugar from carrots; as they yielded only a thick syrup, similar to treacle Nevertheless, these roots have lately been more advantageously employed in distillation.

CART, a land carriage, with two wheels, drawn either by horses or oxen, for conveying heavy goods, &c generally at short distances.

In rural economy, the proper construction, and adaptation of carts to different soils and situations, are objects of the first consequence to every reflecting farmer. Nevertheless, it is surprising, that little attention has been paid to this important subject, previous to the late improvements in agriculture; the flourishing era of which, in Britain, commenced about the middle of last century, or the year 1754, when that patriotic *Society for the Encouragement of Arts, Manufactures, and Commerce*, was instituted at London. Since that memorable period, numberless inventions have been introduced into rural economy, and the names of Lord Romney, Messrs Shipley, More, and many other illustrious promoters of *true* national wealth, will ever be remembered by a grateful posterity. One of the most active members of this respectable institution, is Mr. Arthur Young, of whose public spirit, and

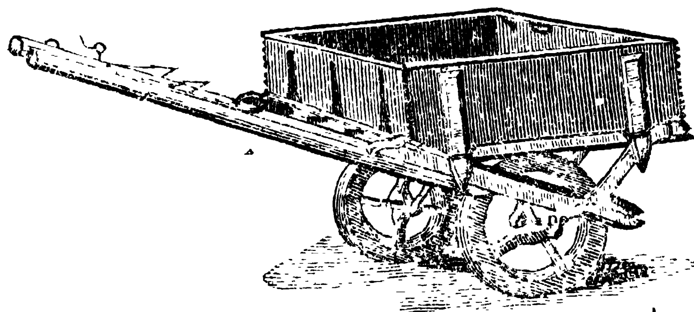
* [They can be horse hoed —T C]

indefatigable labours, we have before us the most ample and satisfactory proofs. His "*Annals of Agriculture*," though conducted on a plan too diffuse for ordinary readers, is a work replete with practical facts; and on the whole, the best illustration of British husbandry. In the 18th volume of these Annals, we meet with an elaborate paper, entitled "*The Farmer's Cart*;" by the editor; from which we shall extract the following particulars: Mr. YOUNG first observes, that the most general farmer's carriage in England, is a wagon drawn by four horses, in which is conveyed corn, hay, wood, &c. but not dung or earth, which are usually moved by carts, or tumbrils, drawn by three, or four horses—carriers almost universally employ broad-wheeled wagons, drawn by eight horses.

[I advi[illegible] man to subscribe with a view to pro[illegible], to any turnpike road whatever, th[illegible] permits a greater load than four horses can draw, and that does not prohibit narrow wheels with this weight. No road *can* be made profitable, if 6 and 8 horse wagons are permitted.—T. C.] See CARRIAGES.

In Scotland, wagons were formerly used, but afterwards changed for large carts, and more lately for small ones, drawn by one horse; [a most important improvement.—T. C.]

In Ireland, the most common vehicle at present is the *one-horse car*, with low wheels beneath the body of the machine; which has universally superseded the use of English carts and wagons, from a conviction of their inferiority. Nothing, says Mr YOUNG, exceeds the amazing expedition with which corn and hay fields are cleared in that country, by means of this useful, though inelegant implement. In consequence of such a decisive encomium, as well as the very favourable account given of this machine by the late Mr. BAKEWELL, of Dishley, Leicestershire, in the "*Communications to the Board of Agriculture*," we have been induced to present our readers with the following cut, and description, of an *Improved Irish Car*.



The advantage of this vehicle, which was preferably employed, and strongly recommended, by the last mentioned agriculturist, consists in the facility with which it is laden, on account of its lowness; and, when gate-ways and roads are narrow, much room is gained by the wheels being fixed under the body of the cart. In such situations, therefore, it is well calculated for carrying manure, especially on meadow or ploughed land; and, for that purpose, its wheels ought to have a flat bearing and to be at least six inches in breadth. Another peculiarity in the construction of this cart is, that its wheels are necessarily cylindrical; and that the facility of draught arising from this unobserved circumstance, was probably imputed to some other part of the machinery. But, though contrary to the generally received opinion, Mr. ALEXANDER CUMMINGS (in his *Observations on the Effect which Carriage-wheels with Rims of different shapes have on the Roads*, printed in the *Communications to the Board of Agriculture*), [See WHEELS,] has satisfactorily demonstrated, and it is likewise evinced by experience, that *The resistance to the cylindrical wheel is not increased, but diminished, by increasing the breadth and the flat bearing of its rim.* The knowledge of this fact is of very great importance to the farmer, as well as to the wagoner; for, by availing himself of this simple improvement, he may be enabled, in almost all seasons, to drive his broad-wheeled

carts, &c. on his meadows or ploughed ground, when no narrow wheel can be employed. The draught is also much inclined, which is a circumstance of great consequence. (See DRAUGHT.) Hence it would be superfluous to enumerate the farther advantages of this implement; yet, when the width of gate-ways and the breadth of roads will admit of the wheels being placed at the sides of the cart, *without confining the width of its body*, it will probably be more advantageous to have them at the sides, than under the cart.

One of the greatest advocates for *one-horse carts*, is Lord ROBERT SEYMOUR, whose excellent paper on this subject, dated Taliaris, 5th September, 1796, (inserted in the 27th volume of the *Annals of Agriculture*) deserves the thanks of all British farmers. This patriotic nobleman strongly recommends the cart which he employs on his estates, as a most useful implement of husbandry. Convinced of its superior excellence, in many situations, we have thought proper to annex an accurate engraving of this cart, for the elucidation of which, we shall extract the following particulars from his Lordship's letter, addressed to the editor of the last mentioned work:

The advantages of single-horse carts are universally admitted, wherever they have been attentively compared with carriages of any other description. By his own observation, Lord SEYMOUR is led to conclude, that a horse acting singly will do half as much more work as in conjunction with another, so that two horses will, separately, perform the work of three conjunctively. This difference, he believes, arises partly from the single horse being so near the load he draws, and partly from the point or line of draught being so much below his breast, as the wheels of single-horse carts are usually made very low. When a horse draws in conjunction with another, he is generally embarrassed by some difference of rate—the horse behind or before him, being quicker or slower than himself: whereas, a single horse has only his load to contend with, and is not inconvenienced by the greater or lesser height of his fellow. Nor is there any necessity for employing additional drivers; as horses, once in the habit of going singly, will follow each other as uniformly, and steadily, as they do when harnessed together: hence, on the most frequented roads in Ireland, one man conducts three, four, or five, single-horse carts, without any inconvenience to the passenger.

Dimensions of the Body of the Cart employed by Lord ROBERT SEYMOUR:—Two feet eleven inches across the bottom; three feet nine inches, inside length; one foot high; sloping top, nine inches.

Iron Wheels.—Two feet eight inches high; rim, three inches and a half wide, and from three-quarters to an inch thick; spoke, three inches and a quarter at each end, worked off to two inches at its centre

In the introduction to the letter above alluded to, his Lordship observes, that the price of iron cast into wheels is 16s per cwt. and the weight of each wheel is about three-quarters of a hundred.—Two inconveniences, however, arise from the use of low cast iron wheels, namely, 1 That such iron is very liable to break upon concussion; and 2 The course of a wheel of so small a diameter, occasions a very quick consumption of grease. The first of these objections is, in a great measure, removed by the facility with which the rim of the wheel may be repaired by the application of wrought iron; the latter being joined to the former by a rivet, the wheel acquires a degree of elasticity, and thus becomes, perhaps, stronger than it was when new. In order to furnish a regular supply of grease, Lord ROBERT has introduced four grooves or cavities in the boxes, increasing a little towards their centres: and with a view to defend the axle-tree which consists of wrought iron, against the harder body of the box, he ordered the extremity of it to be steeled

Mr. ARTHUR YOUNG, in the 18th volume of his *Annals of Agriculture*, before quoted, states the following dimensions of a single horse cart, which he, by the test of experience, has found to be the most advantageous:

Buck.—Length, 5 feet 1 inch.
Breadth, 3 feet 7 inches.
Depth, 2 feet.
Cubical feet, 35 and a fraction.

On his farm of 350 acres, in Suffolk, Mr YOUNG employs only five such carts, and observes, that he would not add more than one to the number, even though he should increase his business to 4 or 500 acres: hay, corn in the straw, faggot-wood, billets, dung, clay, marl, lime, bricks, &c are all conveyed by them, carrying out 9, and even 10 coombs of wheat in sacks, and they are never drawn by more than one horse or

ox. No farm of the same extent, in an arable country, has less than three wagons, three tumbrils, and a light cart: the exact price of these different implements, in the year 1792, amounted to 109*l.* st while the building of *six* carts, upon Mr. YOUNG's plan, costs only 63*l.* thus he saves about 40 per cent. in annual repairs. Besides this great reduction of expense, another circumstance deserves particular notice. As these carts had for many years been the object of ridicule, Mr. YOUNG offered a bet to one of his prejudiced neighbours, that he should load a wagon, till five horses could not stir with it; and Mr YOUNG engaged to carry away that load *with ease,* in his carts, with four of the same horses; but the confidence, which his antagonist possessed in wagons, would not allow him to accept the offer.

The infinite benefit, concludes Mr. YOUNG, of which these carts would be to the roads, if their use should become general, may be easily conceived. In all the examinations before committees of the House of Commons, as well as in most of the treatises published on the subject, it has been admitted that no police or management can keep the roads in repair, while such vast weights are permitted to be drawn in a single carriage. Parliament has been made so sensible of this fact, that repeated acts have been passed, by which the weight of wagons was limited, and a certain breadth of the wheels enjoined. Experience, however, has proved, that both are insufficient, and that the only method of effecting a favourable change would be to prohibit numerous teams. Let every man carry whatever weight he pleases in a one-horse cart, and pay a light toll: let the load of a two-horse cart be limited, and the toll increased; farther lessening the weight, and raising the toll, when four horses are employed; and thus advancing the turnpike expenses for every additional horse, till it amounts nearly to a prohibition. If such a plan were to be adopted, we should soon see all our roads in an improved state. *Rollers* have, indeed, been greatly indulged both in weight and toll; but this was a preposterous measure, for a roller will crush a pebble to dust as well as a wheel, and the badness of roads must be attributed to the materials being reduced to powder, almost as soon as laid on, and either blown away in dust, or carried off in mud. Having followed some of SHARP's wagons, and observed the effect, Mr. YOUNG as persuaded that the roller is more detrimental to the road than nine-inch wheels In such an inquiry, facts only can decide the question: the Irish roads are made at an expense beyond comparison less than the English, and were, at the time he visited that country, greatly superior to those in England. This difference, in his opinion, must be attributed entirely to the use of one-horse carts, as he has explained in his "*Tour of Ireland.*" "Many hundred thousands a-year would be saved in England, if these carts were so favoured in road acts, as to insure a great decrease of wagons." On the whole, he ventures to recommend the use of one-horse carts to his brother farmers, with that confidence which ought to arise solely from numerous and varied experiments.

A predilection has long prevailed in England and America, in favour of large teams and wagons, in regard to which, says Dr. ANDERSON, the great object of emulation seems to be, to try how an immense load of goods may be transported in one carriage without regard to any other circumstance. But this is acting in direct opposition to the best established principles of mechanics, of economy, and of common sense.

The parts of large machines must be made so proportionally thick, because of the largeness of size on which they are constructed, that the very weight of the machine, itself, is a load which not only subjects the owner to a great and unnecessary expense in the purchase, but what is worse, obliges him to be at great expense for horses to drag that unnecessary load from place to place. When four or more horses are yoked to a team, three of these horses must draw horizontally, and consequently in a manner inconsistent with their mechanism, which will be explained under the Article DRAUGHT.

The immensely large wheels of wagons, also add exceedingly to the draught of the horses, because a wagon from the slowness of its motion, obliges the horses to overcome its *vis intertiæ* every moment they are drawing it. That is, it is the same thing as putting it into a state of motion from a state of rest every moment; for every one knows how small a force is capable of keeping a heavy body in motion.

The very great weight of our western country wagons is well known. Let any one then reflect upon the great portion of the horse's strength which is spent in drawing the wagon, besides the

load it contains, and which ought to be applied to support an increase of the latter. Why could not each horse draw his own cart? There can be no doubt, that four horses with each a properly constructed cart, will draw more and with more ease to themselves, than when they are yoked to one wagon.

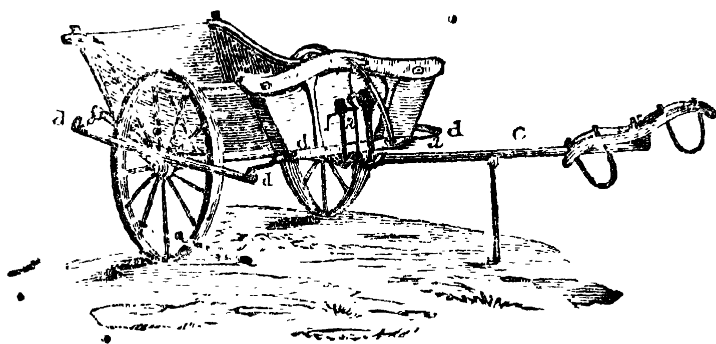
A good horse will draw as a common load 15 cwt. of goods, and travel farther in a day than our wagons, and over worse roads, whereas 10 or 12 cwt. of burthen, is as much as falls to the share of one wagon horse; his superior strength being wasted upon a cumbrous wheel.

The rough roads beyond the mountains may probably prevent the adoption of the plan of one-horse carts, but why could not each horse draw his own cart, from the farms of Lancaster County?

[The experiments in England in favour of one-horse carts, are decisive. I mean as to the profit of those who use them.—T. C.]

The halter of one horse might be tied to the cart which goes before it, and by this means one driver would have the whole as much at command as if they were yoked in the chains of a wagon. A horse has also the momentum of his draught increased by having a portion of the weight on his back. The expense of turnpike may be increased by the carts, but would not the increased freight more than make up?

In the 2d. vol. of "*Communications to the Board of Agriculture*," we meet with a description of a *Drag cart*, and an ingenious method of regulating the centre of gravity of the load; by Lord Somerville. This memoir is illustrated with plates, from one of which we have selected the following figure, representing a perspective view of a cart designed to be drawn by two strong oxen, with a pole, yoke, and bows, such carriage being calculated to convey 45 cwt.



C, is the front of the body of this cart, representing the manner in which the centre of gravity of the load is adjusted; in order to prevent it from pressing too much on the animals, when descending a hill; the front of the cart is elevated by means of a toothed rack screwed on it, and worked by a pinion, and the handle *a*, being immediately connected with the pole *c*. By the aid of this pinion and rack, the front of the carriage is raised in a greater or less degree, according to the declivity; so that the weight of the load bears more on the axle, and less on the necks of the cattle.

On the side of this cart is delineated the position, in which the *friction-drag* is applied, and is made to press in a greater or less degree, according to the steepness of the descent—*d, d*, is the *friction bar;* one end being connected with the tail of the cart, by means of a small chain: and the other being fastened to the front by a toothed rack *b, d*, that catches on a staple in such front; so that the friction bar may be made to act more or less powerfully on the side of the wheel, at the discretion of the driver—the notches, or teeth, on this rack, should be set as closely together as circumstances will permit.

The friction-bar, in the figure above given, is stated by Lord S. to be placed lower on the wheel than it was origi-

nally designed, with a view to divide the pressure and friction more equally on the opposite side of the wheel: so that the action on each is diminished; and the risk of over-heating and destroying the friction bars is rendered less, than if the whole pressure were applied in one point, on the top of the wheel. The advantages arising from the drag here described, are as follow:

1. The pressure and degree of friction may, with great expedition, be adjusted to the steepness of the declivity; so that the carriage will neither press forward, nor require much exertion in the draught.

2. The friction is, with great propriety, applied to the wheel in such a direction, that a *given* pressure will produce *twice* the effect in retarding the progress, which it would have, in case it had been immediately applied to the body of the cart, or to the axis.

3. This apparatus is so easily arranged, that it may be immediately adjusted, without stopping the carriage, or exposing the driver to danger.

4. Lord Somerville's useful contrivance will be of still greater utility when applied to *both* the hind wheels of wagons: for by this expedient, the resistance may not only be always adapted to the steepness of the descent, so as effectually to prevent both the tearing up high-roads, and the unnecessary exertion of cattle, when drawing locked carriages down hills; but also the frequent accidents to which drivers are exposed, will be completely obviated; and that time, which is now spent in locking and unlocking wagon-wheels, will in future be saved.

Having concluded the subject of single-horse carts, we shall only observe, for the information of those who employ teams with two-wheeled carriages, that several useful implements have lately been invented, for the more effectual stopping of such carts, in descending steep hills, and likewise for taking off the increased weight thrown on the shaft-horse's back in all descents. A description of these excellent contrivances, illustrated by the necessary cuts, we shall communicate under the respective heads of Locking-hole, and Wheel drag.

In London and Westminster, carts are not permitted to carry more than twelve sacks of meal, 750 bricks, one chaldron of coals, &c. on pain of forfeiting one of the horses (stat 6 Geo. I. c. 6.) By the laws of the city, carmen are forbidden to ride either on their carts or horses: they are to lead or drive them on foot through the streets, under the penalty of 10s. (stat. 1 Geo. I. c. 57.)

Rolling-carts are very useful machines for carrying manure on low lands, during wet seasons. According to an account given by Mr Richard Moyle, and inserted in the [illegible] vol. of the *Transactions of the Society for the Encouragement of the Arts*, &c. such a cart consists of three circular pieces of strong elm, two feet in diameter, and each eighteen inches long, through which a strong iron axis is passed, so as to protrude a few inches on each end beyond the rollers; after all, allowing an inch between each piece, for the conveniency of turning round. On the projecting part o the axis, a fixed frame is placed, for supporting the body of the cart, which, according to the nature of the soil, may be loaded to any degree, and employed simply as a roller, or for carrying manure, &c. on land where common wheels cannot be admitted.

By means of these rolling carts, the surface of the land is to be frequently compressed, in order to consolidate the soil more perfectly, so that the earthy particles may embrace the roots of the grasses, and retain their proper moisture; on which the luxuriancy of such soils in a great measure depends.

CARTILAGE, is a smooth, white, elastic, and insensible animal substance, somewhat approaching to the nature of bones.

Cartilages have a natural elasticity, the power of which is so great that, on being forced out of their situation, they spontaneously return to it, as soon as that force is removed. They are principally situated in those parts of the human body, which require a slight and easy motion, as in the ears, [illegible] &c. Their elasticity suppl[illegible] the place of antagonist muscles, or such [illegible]s are by Nature designed to counteract each other. Cartilages also invest all the ends of those bones, that are conjoined for performing motion; because, as they are both smoother and softer than bones, which are insensible, the attrition occasioned by the motion of the joints is thus more effectually guarded against.

CARTOON, from *carta*, paper, and *oni*, large, (Italian,) a design drawn upon large sheets of paper for the purpose of being traced upon any other substance, where the subject is to be finished. The most famous are those

of Raphael, seven of which, after having lain in the store-rooms of a tapestry manufactory, from the age of Leo X. and suffered various rough usage, were purchased, by Charles I. of England, and are now at Windsor-castle.

CARTOUCHE, in the military art, a case of wood about three inches thick at the bottom, girt with marlin, holding about 400 musket balls, besides 6 or 8 balls of iron of a pound weight to be fired out of a howitzer for the defence of a pass.

CARVING, the art or act of cutting or fashioning a hard body, by means of a chisel or other sharp instrument. The term *carving* is generally applied when wood is the body carved: the same operation upon stone being denominated *sculpture*. In carving a figure or design, the outline must first be drawn or pasted on the wood. The wood fittest for the use is that which is hard, tough, and close; as beech, but especially box.

CARYATIDES, in architecture, an order of columns or pilasters, under the figure of women, dressed in long robes, after the manner of the Carian people, and serving instead of columns to support the entablement.

CASCARILLA, is the bark of the *Croton eleutheria*, L. a native of the East Indies, whence it is imported in the form of curled pieces, or rolled up into short quills, about an inch in width; externally resembling the Peruvian bark. It is said to be also found in Georgia.

Divested of its whitish upper rind, the Cascarilla possesses an agreeable smell, and a bitterish, pungent, aromatic taste. This inflammable drug, when burning, with tobacco, emits a fragrant odour, like that of musk.

The cascarilla is frequently and successfully administered in intermittent fevers, joined with the Peruvian bark.

CASE-HARDENING *of Iron*, is a superficial conversion of that metal into steel, by a cementation of it with animal coals. This operation is usually performed on small pieces of iron, worked into tools and instruments, by putting them together with the cement, into an iron box, which is closely shut, and exposed to a red heat, for several hours. Thus, the surface of the iron, to a certain depth, is converted into steel, to which a proper degree of hardness may be given, by a sudden immersion of the heated pieces into a cold fluid. See CUTLERY, IRON.

CASSAVA, or *Iatropha Manihot*, L. a native shrub of South America, which grows from four to seven feet high, is knotted, covered with an ash-coloured bark, and pithy within: its broad palmated leaves, together with its white and rose-coloured blossoms, render it a very beautiful plant. According to M. BRUNELLI, it may be propagated by seed, but more expeditiously by suckers: when these are planted in a deep, rich, and light soil, they vegetate with surprising luxuriance, and produce in the course of one year, a white, soft, and farinaceous root, from one to two feet in length, and from five to six inches in circumference.

The very extensive use of the cassava, as an article of food in South America, is a striking instance of human ingenuity successfully directed to prepare wholesome nutriment from such vegetables as, in their natural state, are very active poisons. A mild, nutritious food is obtained from these roots in the following manner: Immediately after being gathered, they are washed and stripped of their thick rind by means of a knife: the heart, a pulpy mass, either white or yellowish, is repeatedly passed between cylinders, and turned by mill-work, till all the juice is expressed. The dry pulp, being thus freed from the poisonous juice, is a compound of farina and vegetable fibre, and requires no farther preparation than to be thoroughly dried, over a very slow fire. In this state it will keep for several months in close vessels; and, when wanted, it may be formed into cakes, by kneading up with water, and baking it; or into pottage, by boiling it with water, and a little Cayenne pepper. The *tapioca* of the shops, is the farina or starch separated from the fibrous part.

CASSIA, in botany, a genus of plants comprising thirty species, the most remarkable of which are:

1. The *cassia fistula*, L. or purging Cassia of Alexandria. It is indigenous in Egypt, and both Indies, and bears a cylindrical pod, containing a soft, black pulp, of a sweetish taste, which dissolves, for the most part, both in water and rectified spirit. This pulp is a gentle laxative, and frequently given, in doses of several drachms, to persons of costive habits. In inflammatory complaints, it is sometimes administered in much larger doses, from one to two ounces, when acrid purgatives are improper; though it is apt to nauseate the stomach, and produce flatulency, and griping; especially if the pulp be of an inferior kind, or spoiled

by long keeping: these effects may, however, be obviated by the addition of aromatics, and by taking it in a liquid form.

There are several species of Cassia in the United States. Two in particular deserve notice: a. *Cassia Marylandica,* is used as a purgative and possesses nearly the same virtues as the *senna* of the shops; both plants belong to the same genus.

b. *Cassia Chamæchrista,* is cultivated in Maryland, and on the eastern shore of Virginia for the purpose of recovering worn-out lands, and of enriching such as are naturally poor. Sandy lands, in particular, are ameliorated by it. It bears the absurd and confusing trivial names of Eastern-shore Bean, Golden Cassia, Peacock Flower, Aquamaque, or Magothay-bay Bean. Mr. Bordley asserts, that "this plant, which is *not* the *partridge* pea, is so difficult to eradicate, that it might become an injurious weed in other soils and courses of crops than those in Aquamaque. The courses there being maize and oats, lay on a sandy, loose soil" This plant is particularly described, and an account of its culture, detailed by Dr. Greenaway. *Amer. Phil. Trans.* vol. 3.

2 The *Cassia Senna.* See Senna.

CASSINE, *South Sea Tree, a native of the Southern States,* rises to the height of ten or twelve feet, sending out branches from the ground upwards, which form themselves into a sort of pyramid. The flowers are produced in close whorls at the joints of the branches, near the footstalks of the leaves; they are white, and are succeeded by red berries, which continue upon the plant most part of the winter, and being of a bright red colour, make a fine appearance intermixed with green leaves.

Cassine is thought to be one of the most powerful diuretics hitherto discovered. It also vomits severely. It is highly esteemed among the Southern Indians, who call it "Youpon." They use the plant in decoction. Cassine is generally supposed to be the same plant that is called "Paraguay" in South America, where the Jesuits formerly made a great revenue from the leaves, of which an account is given by Mr. Frezier.

CASSIOPEIA, a constellation in the northern hemisphere, situated opposite the great bear, on the other side the pole. In the year 1572, a remarkable new star appeared in this constellation, surpassing Sirius or Lyra in brightness. It appeared bigger than Jupiter, but after a few months it declined; and in a year and a half entirely disappeared.

CAST, among artists, any statue or part of a statue, of bronze, or of plaster-of-Paris. A cast is that which owes its figure to the mould into which the matter of it has been poured, or cast while in a fluid state; and thus differs from a model, which is made by repeated efforts with a ductile substance, as any adhesive earth; and from a piece of sculpture, which is the the work of the chisel.

[To varnish plaster-of-Paris casts or models, take about a quarter of an ounce avoirdupoise of the finest white soap, grate it small, and put it into a new glazed earthen vessel, with an English pint of water; hold it over the fire till the soap is dissolved, then add the same quantity of bleached wax, cut into small pieces: as soon as the whole is incorporated, it is fit for use.

Mode of application. Dry the model well, at the fire, suspend it by a thread, and dip it in the varnish; take it out, and a quarter of an hour after dip it again; let it stand for six or seven days, then, with a bit of muslin rolled softly round your finger, rub the model gently, and this will produce a brilliant gloss, but this part of the operation must be done with great care, and by a light hand, as the coat of varnish is thin.

Another way.—Take skim milk, from which the cream has been carefully taken off, and with a camel's hair pencil, lay over the cast till it holds out, or will imbibe no more, shake or blow off any that remains on the surface, and lay it in a place free from dust; and when it is dry, it will look like polished marble.

N. B. This last mode answers equally well with the former, but will not resist the weather.—T. C]

CASTING, in foundery, the running of metal into a mould: among sculptors, it is the taking casts or impressions of figures, &c. Plaster-of-Paris is the most usual material employed for this purpose. This, when bought at the shops, requires no other preparation than that of a careful mixture with water, to the thickness of treacle, when it may be poured into the mould. It dries, or *sets,* in a short time, and ever afterward retains a sufficient degree of hardness.

Castor. See Beaver.

CASTOR-OIL is extracted from the castor nut, or the seed of the Palma Christi, *Ricinus communis*, a native of the West Indies. These seeds are about the size of small beans, which, in their brittle shells, contain white kernels, of a sweet, oily, but somewhat nauseous taste. Nor is the expressed oil quite free from the acrimony of the nut; though it is, in general, one of the mildest and safest purgatives; so that half a tea-spoonful for a dose has been given, with success, to new-born infants, for lubricating the first passages, and expelling the *meconium*. It is also one of the best vermifuges, and a most efficacious remedy for the dry belly-ach, and iliac passion, when administered in proper doses, to children and adults; viz. the dose for the former, from one to two tea-spoonfuls; and the latter, a table-spoonful, repeated every two or three hours.

As patients generally have a great aversion to this oil, in its pure state, it may be taken swimming either in a glass of peppermint, or simple water, or in the form of an emulsion, with mucilage, or with the addition of a small quantity of rum. [Mix brandy and water till the oil will just sink in it, but remain suspended. The cold-drawn, limpid, colourless oil is the best. T. C.]

The plant producing this excellent medicine grows very well in Pennsylvania. It is said there are two sorts, one with a reddish stalk, another with a light blueish stalk. The plant of this last kind only, is propagated for the oil; the former is supposed to have poisonous qualities. To procure the oil, shell the seeds and boil them in water; as the oil rises, skim it off. When the seeds yield no more to the water, press them wrapped loosely, in a coarse cloth, or hair bag. This oil is sweet without bad taste or smell, and as clear as olive oil: or bruise the seeds and boil them. The oil skimmed off is much purer, and may be kept much longer than that obtained by expression, because the water detains the mucilage, which abounds in the expressed oil, and disposes it to spoil sooner. This plant should be cultivated in every garden in this state and south of it. In the warm sands of New Jersey it would thrive well, if the seeds were put in the ground early in the spring. Every farmer might raise as much castor oil in one year as would be required by his family during several years: and an experiment is worth making upon half an acre of plants as to the profit of their produce. The plant is cultivated largely near Lexington, Kentucky, and in New-York. In Georgia, and in the Floridas, it grows to a great size.

CAT, or *Felis Catus*, L. a genus of animals, comprising twenty-one species, and belonging to the same class as the lion and the tyger. Though originally a variety of the wild cat, one of the most ferocious brutes, this animal is now domesticated, and bred in Britain, as well as in other parts of Europe, Asia and Africa, of which countries it is a native. The former inhabits hollow trees, especially the oaks of large forests, and in winter retreats to the deserted holes of foxes and badgers. It skin is an excellent fur, but by no means compensates the damage done by wild cats to game and poultry.

The domestic cat, when suffered to retire to thickets, easily returns to a wild state. Its colour is uncommonly diversified: but the most beautiful varieties are, the reddish Spanish cat, and that of Angora, with long silken hair. A tame cat generally attains the age of about twelve years: the female breeds in the first year; though it grows till eighteen months old; she usually produces from four to six blind kittens, after a gestation of fifty-five days; and carefully conceals them, apprehensive of the unnatural voracity of the male. It is farther remarkable, that the female also has been observed to devour her offspring, when it happened to be deformed, or monstrous.

The flesh of animals, or fish, is the most agreeable food to cats; for they partake of vegetable aliment only from necessity. As they chew with difficulty, frequent drink is indispensably requisite to the preservation of their health. There are, however, some plants of which they are excessively fond; and when indulged with them, present a variety of whimsical gesticulations: of this nature is the valerian root, and the herb called nep, or catmint, the *nepeta cataria*, L.; on the contrary, they shun other vegetables as their mortal enemies, for instance, the common rue, or *ruta graveolens*, L. Any substance rubbed with the leaves of this plant, is said to be perfectly secure from their depredations: for the communication of this useful fact, in domestic life, we are indebted to C. F. FUNKE, a German naturalist.

Cats enjoy a warm temperature, and a soft couch; moisture and filth, as well as water and cold, are equally repugnant to their nature; hence they are continually cleaning themselves with their paws and tongue. Another peculiarity is, the *purring* of these animals, when they are cajoled, or flattered, by passing the hand over their backs: this singular noise is performed by means of two elastic membranes in the larynx, or the upper part of the wind-pipe. Their hair is so electric, that the expanded skin of a cat makes an excellent cushion for the glass cylinder, or globe, of an electrifying machine.

The flesh of cats is eaten by several nations,* but the substance of the brain is said to be poisonous? From the intestines of these animals are manufactured the celebrated Roman chords, for covering the violin.

[They are manufactured out of the guts of rabbits and sheep also: they are cleaned, soaked in water, stretched by a machine and dried. The name cat-gut comes from the circumstance of cats being used as food in many parts of Italy, and their guts applied to the making of strings.—T. C.]

With respect to their peculiarities, we shall remark, that cats possess a very acute sense of both smell and sight; by the structure of their eyes, which sparkle in the dark, they are better enabled to discover objects of prey, such as mice and rats, at night, than in the day time: hence they ought not to be luxuriously fed, if kept for the destruction of those vermin. It is, however, to be regretted, that this useful domestic creature is one of the most deceitful companions. Constantly bent on theft and rapine, the cat is a compound of cunning and dissimulation, seizes every opportunity of doing mischief, and flies from punishment, when detected. It is, therefore, not a little surprising, that many elderly ladies are so partial to these quadrupeds, that they will even suffer them to sleep in the same bed; a practice fraught with considerable danger; as the exhalation of cats is extremely detrimental to the lungs; besides which, they are liable to hydrophobia, as well as the more faithful dog. For these reasons, we would advise parents, not to permit their children to play for hours, with these animals, even though the swallowing of cat's hair should not be attended with such bad effects as many are inclined to believe.

Many persons have so invincible an antipathy against these creatures, that they have been known to f[illegible] where cats were concealed; and that no arguments were sufficient to efface the impression.* We are, therefore, decidedly of opinion, that great precaution ought to be used in the treatment of them; and instead of provoking them to malice and anger, it will be more prudent to keep them at a due distance.

CATAPLASM. See POULTICE.

CATARACT, of water: a fall or precipice, in the channel, or bed of a river; caused by rocks or other obstacles, stopping the course of its stream, from whence the water falls with a noise and impetuosity. Such are the cataracts of the Nile, the Danube, Rhine, &c. In that of Niagara the perpendicular fall of the water is 137 feet

CATARACT. See GUTTA SERENA.

CATARRH, or COLD, a disease arising generally from a sudden diminution of insensible perspiration, by exposing the body to a damp, or cold air, after having been, for some time, under the influence of a warmer temperature.† It is at first attended with an increased secretion of mucus, from the glands and membranes of the nose, eyes, throat, windpipe, &c; hence a defluxion of a thin, acrid humour, which irritates those glands and membranes, occasions some difficulty of breathing through the nose, with a sense of fulness, and sooner or later, produces all the usual symptoms of a common cold. Contrary to the prevailing opinion, we are convinced that bleeding is seldom, if ever, necessary in these, and similar affections. As, however, catarrhs are sometimes attended with a slight degree of inflammation and fever, their treatment must be regulated accordingly: but, if unaccompanied with febrile symptoms, there is no danger to be apprehended. In the latter case, only, we shall suggest a few directions for managing those frequent

* [It is commonly eaten in many parts of Italy.—T. C.]

* [The bite of cats when highly provoked produces incurable madness and hydrophobia.—T. C.]

† [Rather from too sudden alternations of heat and cold; and most frequently from *sudden exposure to warm rooms*, after being exposed to cold and damp air.—T. C.]

complaints, which are generally neglected at their commencement.

It was formerly maintained, that *all* colds may be cured by *sudorific* remedies; but experience has proved that [illegible], though sometimes successful, has often been productive of injury. In modern times, the opposite treatment has been adopted, and both the internal use, and external application of cold water, have been indiscriminately recommended. The true and proper plan, however, appears to be the medium between these extremes; for it cannot be doubted, that keeping the body too warm, and excessive indulgence in hot, diluent drink, predispose it to catarrhs; as, on the other hand, the internal and external use of cold water tends to strengthen the whole animal frame, and renders it less susceptible of the impressions of air and cold. But, unfortunately, the *preservative* means have, in this instance, been confounded with the *curative*, or those intended for effecting the cure. Hence, in the beginning of every catarrh, the following particulars deserve attention:

1. To dilute and weaken the acrid humour, secreted by the glands: this purpose may be attained by inhaling the steam of water, and drinking proper quantities of tepid diluents.

2. To prevent too great a defluxion of humours, or to render the mucus itself milder, and facilitate its excretion, it will be of great advantage to apply vesicatories contiguous to the parts most affected by the cold. (See Blister.)

3. To evacuate the concocted, or digested matter: this salutary effect is accomplished either by spontaneous defluxion, or by the pores and urine. Both must be principally intrusted to Nature; as we should assist, and direct her operations only in the mildest, and most cautious manner.

Dr. Mudge, in a treatise on this disease, recommends the steam of hot water, as a most efficacious and safe remedy, and which indeed he considers as almost *infallible*. The method of inhaling these steams is very simple; but he observes that, for healthy persons, who may accidentally see his machine, great precaution is necessary, not to make the experiment of respiring through cold water; as thus they would be almost certain of contracting a severe cold. For those troubled with a catarrh, he directs as follows: In the evening, a little before bed-time, the patient, if an adult, is to take three drachms, or as many tea-spoonfuls of paregoric elixir, in a glass of water: but, if a child, under five years of age, one tea-spoonful; or, from five to ten years old, two. About three quarters of an hour after, the patient should go to bed, and, being covered warm, the inhaler three parts filled with water, nearly at the boiling point (which from the coldness of the metal, and the time it ordinarily requires before it is used, will be of a proper temperature), and being wrapped up in a napkin, but so as not to obstruct the valve in the cover, which is to be placed at the arm-pit, and the bed-clothes being drawn up, and over it, close to the throat, the tube is to be applied to the mouth, and the patient should inspire and expire through it, for about twenty minutes, or half an hour.

It is very evident, says Dr. Mudge, as the whole act of respiration is performed through the machine, that by inspiration the lungs will be filled with air, which will be hot, and loaded with vapour, by passing through the body of water; and in expiration, all that was contained in the lungs will, by mixing with the steam on the surface of the water, be forced through the valve in the cover, and settle on the surface of the body, while under the bed-clothes.

The great use of this particular construction of the inhaler is, 1. As there is no necessity, at the end of every inspiration, to remove the tube from the mouth, in order to expire from the lungs the vapour which had been received into them, this machine, may, therefore, be used with equal facility by children and adults. 2. As febrile symptoms frequently accompany the disorder, the valve, in that respect, is also of the utmost importance: for a sweat, or, at least, a free perspiration, not only relieves the patient from the restless anxiety of a hot, dry, and, sometimes, parched skin, but is of all evacuations, the most eligible for removing the fever: and it will be generally found, that, after the inhaler has been used a few minutes, the warm vapour under the clothes will, by settling upon the trunk, produce a sensible perspiration, which will gradually extend itself to the legs and feet.

In any feverish habit attending this cough, it would be proper to take a draught of warm, thin whey, a few minutes before the inhaler is used; and after the process is over, the sweat

which it has occasioned, may be promoted by drinking small draughts of weak, warm whey, or barley-water. The sweating is by no means so essential to the cure of a catarrhous cough, as that the success of the inhaler at all depends upon it; yet the Doctor observes, that its advantages are very important, when the disease is accompanied by febrile symptoms.

After this respiratory process is performed, the patient generally passes the night without the least interruption by the cough, and feels no farther attack than, perhaps, once or twice, in the following morning, to throw off the trifling leakage, which, unperceived, had fallen into the bronchiæ and vesicles, during the night; the thinner parts of which, being evacuated, the remainder is easily expectorated.

However, continues Dr. MUDGE, if the patient hopes not to be disappointed in the success of this process, it is essentially necessary that he strictly attend to the following rules:

1. As valetudinarians are but too well acquainted with the first symptoms of this disorder, the remedy must be used the same evening; which will, in an ordinary attack, be attended with an immediate cure: but, if the soreness of the respiratory organs, or the petulance of the cough, indicate the severity of the cold, the inhaler, without the opiate, should be repeated the next morning.

2. If the use of this apparatus, &c. be delayed till the second night, it will be always proper to repeat the process the following morning, without the opiate, except where the attack has been violent.

3. Should the cough be neglected for some days, it will always be necessary to employ both parts of the process at night, and the succeeding morning, as the first simple inflammatory mischief is now most probably aggravated by an additional disease, of a chronic nature. But if this should be omitted, and the cough continue to harass the patient, it is of the utmost consequence, particularly in delicate and tender individuals, to attempt the removal of it as soon as possible, before any floating acrimony in the constitution (from the perpetual irritation) receives an habitual determination to an organ so essential to life as the lungs.

If the patient, with ease and freedom, expectorates a thick, and well digested, inoffensive phlem, there is generally but little doubt of his throwing off the disorder, with common care, in a few days and till that be accomplished, a proper dose of paregoric elixir, for a few successive nights, will be found very useful, in suppressing the fatiguing irritation, and ineffectual cough, occasioned by a matter which in the early stage of the disease, flows into the bronchiæ during the night, and is generally too thin to be discharged by those convulsive efforts. But should the cough still continue, notwithstanding a *free* and *copious* expectoration, and the discharge, instead of removing the complaint, become a disease greater than the constitution can support, it is possible that a tender patient, possessed of weak and relaxed lungs, may do himself irreparable injury without the least appearance of purulence, or any suspicion of suppuration. In those cases, besides increasing the general perspiration, by the salutary friction of a flannel waistcoat, change of situation, especially long journies on horseback, conducted as much as possible, through a thin, sharp, dry air, will seldom fail to remove the complaint. On the contrary, if the cough should continue dry, husky, without expectoration, and fatiguing to the breast, provided there be no apprehension of tubercles, either forming or already formed, there is not, perhaps, a more efficacious remedy for it than half a drachm of gum ammoniac, with eighteen or twenty drops of liquid laudanum, made into pills, taken at bed time, and occasionally repeated. This excellent remedy was recommended by Sir JOHN PRINGLE; and, Dr MUDGE observes, that he has, in many instances, found it to be very successful, and generally expeditious; for it almost uniformly produced an expectoration, and abated the distressing fatigue of the cough. The latter practitioner has also, in many instances, drawn a salutary revulsion made from the lungs, by the simple application of a large plaster, about five or six inches in diameter, of Burgundy pitch, between the shoulders; as the perspirable matter which is pent up under it, becomes so sharp and acrid, that it generally produces, in a few days, a very considerable itching, some little tendency to inflammation, and frequently a great number of boils. This application should be continued (the plaster being occasionally changed), for three weeks, a month, or longer, if necessary.

Although seemingly a trifling precaution, yet it is by no means a useless one to the patient, not to expose his shoulders to the cold air, while in bed, during the night; but to take care that they be kept warm, by drawing the bed-clothes up to his neck, when he reposes.

If, notwithstanding these, and other means, the cough should continue dry, or be unattended with a proper expectoration, and together with a soreness, produce shooting pains through the breast, and between the shoulders, accompanied with difficulty of breathing, flushes of the cheeks after meals, a burning sensation in the hands and feet, and other symptoms of a hectic fever, no time must be lost, as there is the greatest reason to apprehend, that some acrimony in the habit is determined to the tender substance of the lungs, and that consequently tubercular suppurations will follow. In this critical and dangerous situation, the Doctor observes, from long experience, that the patient will derive the greatest benefit from a change of air, and spare diet. His advice concerning large bleedings, appears to us liable to many objections.

[Colds proceed mostly from repletion, particularly hot suppers. To cure: 1. Bleed if the pulse indicates it. 2. Purge. 3. Vomit. 4. Keep within doors, eat nothing, and drink at least half a gallon of weak tea, toast and water, or other diluting liquor, in the course of a day.—T. C.]

CATECHU, or *Mimosa catechu*, L. or sensitive plant, which is a native of the Malabar coast in the East Indies, and comprises above sixty species. From this plant is produced the extract denominated catechu, which was for a long time erroneously called *Terra Japonica*, from the earthy particles it contains. It is nearly pure tannin

The extract of Catechu, when in its purest state, is a dry substance, which may be reduced to powder, and almost entirely dissolved in water, or in spirits of wine. It is a mild, but excellent astringent, and leaves in the mouth an agreeable sweetness. This medicine is more particularly useful in alvine fluxes; and where, on this account, astringents become necessary, it is perhaps the most salutary. It is also successfully employed in complaints peculiar to females, laxity and debility of the viscera, in general, and in various other diseases, which requires strengthening remedies.

When dissolved in the mouth, the catechu has frequently afforded relief for weak and ulcerated gums, for aphthous eruptions, or the thrush, and similar affections.

The best form in which catechu can be taken, is that of simple infusion in warm water, with the addition of cinnamon, or cassia: thus it is freed from its impurities, and rendered more palatable. It is given in doses from fifteen to forty grains, according to the age and constitution of the patient.

[It is best in infusion; and is useful in those cases of diarrhœa and dysentery that do not yield to opium, cathartics and diaphoretics —T. C.]

CATERPILLAR, *Eruca*, a genus of insects, comprehending many species, of which that most generally known is the common or garden-caterpillar. The natural food of these creatures consists of the leaves and verdure of vegetables; but, harmless as they appear, there are some species among them which destroy one another, whenever an opportunity offers: the generality of caterpillars, however, are very peaceable, and many species live together in the same place, without molesting each other. These would breed and multiply to an incredible degree, were they not devoured by other insects, which prey upon them, both externally and internally, and literally consume them alive

Caterpillars are very destructive in gardens and fields, especially those denominated the black, and the black-canker caterpillar, which prey principally on turnips The former insect is of the colour of soot; and, when full grown, about three quarters of an inch in length. It commences its depredations in England towards the end of August, or the beginning of September, and is particularly numerous, when the north or easterly winds prevail. To counteract the devastation occasioned by this insect, it has been recommended at the first ploughing to irrigate the furrows with lime-water, which will effectually destroy it; as few insects like the smell of any thing that has been burned.

The black canker caterpillars are principally found in the county of Norfolk, where, from the great number of insects which have been washed upon the beach, by the tide, it is generally believed that they are not natives, but wafted across the ocean. These cankers are supposed to be the caterpillar state of the yellow fly, which is parti-

cularly destructive in fields planted with turnips and cabbages, for they have been observed regularly to assume the appearance of those flies. For this evil, there appears to be no other remedy, but to pull the creatures off their nests, and to watch the flies, which during the hot weather are daily depositing their eggs on those plants.

There is also another variety, called by gardeners the *grub*, the skin of which is very tough, and of a brown colour. This insect is particularly injurious, usually depositing its eggs in the very heart of the plants, through all the blades of which it eats its way, leaving behind a great quantity of its excrement, which is hurtful to vegetation. Grubs likewise burrow under the surface of the ground, and do great damage to young plants, by eating off their tender stalks, and drawing them into subterraneous holes. This mischief is principally done in the night; but if the earth be stirred about an inch deep, where a plant is found to be thus injured, the insect will be discovered and this is the only certain way of exterminating these noxious vermin.

When caterpillars attack fruit-trees, the most efficacious way to destroy them is the following Make a strong decoction of equal quantities of rue, wormwood, and common tobacco, and sprinkle this liquor on the leaves and young branches every night and morning, while the fruit is ripening.

Various other experiments have been made with a view to extirpate these mischievous vermin. We shall, however, mention only the following methods, which have been attended with peculiar success. Take three quarts of water, and one quart of vinegar; let them be heated till they nearly boil; then put one pound or more of pure soot into the mixture, and stir it with a whisk till the whole is duly incorporated. Sprinkle the plants with this preparation every morning and evening: in a few days all the caterpillars will disappear. This has also been effected by sprinkling plants (and more especially gooseberry-bushes, which are remarkably subject to the depredations of these insects) with a preparation consisting of one quart of tobacco-liquor, in which an ounce of alum has been dissolved. As soon as the plants or bushes appear to be in the least degree corroded, or any eggs are observed on the leaves, a brush should be dipped into the liquor, which, by drawing the hand gently over its hairs, is carefully sprinkled on them If any eggs be there deposited, they never come forward after this application; and if those eggs have already been changed into worms, they will die or sicken, so as to fall off the bush; in which case they may be easily killed.

When the trunk and boughs of trees abound with the eggs of caterpillars, especially in the early spring, it is advisable to rub the bark of all the affected places with a sponge dipped in soap-water; and, where the height of the tree renders it necessary, this operation may be facilitated, by fastening pieces of flannel to a lath or pole, after soaking them in a similar liquor.

The following excellent observations upon the means of preventing the effects of caterpillars on fruit-trees are by W. Hampson, Esq.

Some time ago, having an intention to improve a number of apple-trees, which, owing to their being yearly infested with the caterpillar, had been long neglected, I began in the following manner. It being early in the spring, I first caused the thick brown moss to be removed from the trunk of the tree, around which, but at a distance equal to the extremities of the roots, I spread warm rotten litter; and then with the back of a pruning knife, scraped off the livid-coloured moss with which the branches of the tree were entirely incrusted. But what surprised me, and to what I would beg particular attention, was, that small detached pieces of moss hung upon the bough by fine threads after it had been cleaned: this led me to think they belonged to some eggs or insects which lay concealed between the moss and the outer bark, or between the outer and the inner rind: but being then without the help of glasses, my curiosity remained unsatisfied, although the effects discovered in the opening season justified my strongest apprehensions; for those trees which had been thoroughly cleaned, put forth strong and healthy shoots, and retained their leaves, when others, their neighbours, were eaten up; yet what convinced me beyond the least doubt was, a tree which through negligence had been left in part cleaned, the boughs which I had cleaned were untouched by the caterpillar, on the contrary, the leaves of those boughs I had not cleaned were soon consumed by them.

These facts being stated, the follow-

ing remarks are naturally suggested: First, that the eggs of the caterpillars lie, during the winter, concealed in such trees as are overgrown with moss, between the moss and the rind, or, where the rind is decayed, in the cavities occasioned by such decay; a circumstance which, with the assistance of a microscope, I have since ascertained: but through mere neglect, having not preserved the eggs for future observation, I cannot say, determinately, they were the eggs of the caterpillar; but this I can say, that the removal of those eggs prevented the leaves of the tree from being eaten. Secondly, that the proper time for destroying them would be before the eggs are hatched; for, by the time the caterpillar is come out, the buds begin to open, and of course become its immediate prey; and as the butterfly tribe are so numerous and so perfectly free from restraint, the nature of the case will require an annual search to be made in such places as are thought favourable to them for depositing their eggs: there will be often found full grown trees, which by being encumbered with branches, the power of the sun is not admitted to shrivel the old rind as the new one is forming; consequently such trees become incrusted with decayed coats, the fit receptacles for preserving the embryo caterpillars; and such trees whose wounds have been suffered to heal, so as to form an hollow, retaining moisture, which cankers the wood, and renders it easily perforated by the fly, are likewise liable to become a prey to the insects they have preserved. See GOOSEBERRY.

About the middle of the last century, experiments were made to manufacture *paper* from the cods which caterpillars spin, and in which they undergo their transformations from a worm to a nymph, or chrysalis, and thence to a butterfly. These cods, after being cleared of the leaves that adhered to them, and well beaten, were reduced to a kind of pulp, which when spread in water, was collected into the form and made into sheets of paper of a coarse brown colour; but as some of them were much whiter than others, it was supposed, that by being beaten and washed a longer time in the mortar of the mill, they would acquire a greater degree of whiteness. At the present period, when the materials for manufacturing paper are exceedingly scarce, we would recommend a repetition of this experiment, for, if the result should be successful, considerable advantage may be derived from the cods of those insects, which occasion often irreparable damage to the industrious cultivator. See also INSECT.

WATER-CATERPILLARS, *Erucæ aquaticæ*, L. are thus called from their living under water. They feed on aquatic plants, and respire by their stigmata in the same manner as the common caterpillars of the garden.

There are, according to REAUMUR, two varieties of these insects, the one on the *Potamogeton*, or pondweed; the other upon the *Lenticula*, or duck-meat: the first of these is the larger; and as its operations are more easily distinguished, it is better known than the other. Though strictly an aquatic animal, it does not delight in the water, and is extremely solicitous to avoid wetting itself. It is produced in the same manner as the land-caterpillar, from an egg which the parent butterfly deposits on the leaf of a certain plant, out of which the insect, as soon as it is hatched, gnaws a piece of a circular form. This it carries to another part of the same leaf, and places it so as to construct a cavity in which it may safely lodge. It then fastens down the piece to the larger leaf, by silk of its own spinning, leaving holes at certain distances, through which it may push its head, and prey upon the adjoining leaves: these are naturally so smooth, that they are seldom wetted; and, as often as its habitation becomes too small, the insect makes others successively, each being adapted to its periodical size, till it undergoes the usual changes into a butterfly. In this state, as soon as its wings are dry, it leaves the water, never to return again.

WOOD-CATERPILLARS, *Erucæ sylvestres*, are thus denominated, because they live, contrary to the generality of caterpillars, under the bark, in the trunk, branches, and roots of trees, and sometimes in the body of the fruit. They are produced from eggs deposited on the surface; and eat their way farther, as soon as they are hatched.

Some of these caterpillars leave their abode in order to change into their chrysalis, and thence into their butterfly state; but most of them remain there, and pass through all their changes. These insects would increase to an immense number, were they not destroyed in a similar manner with the common caterpillars, by a species of worms, that insinuate themselves into the fruit or tree inhabited by the for-

mer, which successively become their prey.

Various experiments have been tried to extirpate these pernicious vermin; but none has been attended with more success than that of lighting small fires near trees, about sun-set, into which they will eagerly fly; and thus, by burning their wings, meet with inevitable destruction.

[Light a fire of straw, or smoking wood, to windward of a field infested with caterpillars; sprinkle a little flour of sulphur in the fire.—T C]

CATHARTICS. See PURGATIVES.

CATHOLIC, any thing that is general or universal. The Romish church distinguishes itself by the name of *Catholic*, in opposition to all those which have separated themselves from her Communion, considering herself as the only true and Christian church. In the strict sense of the word, there is no Catholic church in being; that is, no universal Christian Communion.

CATMINT, or NEP, the *Nepeta Cataria*, L. a native plant growing on pastures and hedges, in a calcareous soil. Cats are exceedingly fond of it, especially when it is withered. Mr. RAY mentions, that he had transplanted the common catmint from the fields into his garden; but the cats soon destroyed it: those plants, however, which came up from the seeds, uniformly escaped; and thus he found the old proverb verified, namely, "If you set it, the cats will eat it; if you sow it, the cats will not know it."—The plant is eaten by sheep, but refused by cows, horses, goats, and swine.

A watery infusion of the leaves and stalks of this plant, is a common and successful domestic remedy in Pennsylvania, for promoting perspiration, when the body is affected by flying pains after exposure to cold. [I believe it is worthless.—T. C.]

CATOPTRICS, that part of optics which explains the properties of reflected light, and particularly that which is reflected from mirrors.

CATTLE are those quadrupeds, which serve either for tilling the ground, or as food for man. They are divided into *black cattle*, which comprise horses, oxen, bulls, cows, and their young; and into *small cattle*, that is, rams, ewes, lambs, goats, &c.

Having incidentally treated on some of the animals that are classed under this denomination, we shall confine our present account to the management of cattle in general: pointing out such vegetables, as may be given them with advantage, together with a few supplementary rules, to be observed in the breeding of these useful animals, and and some observations on the most common distempers to which they are peculiarly liable.

I. *With respect to Food.*

The first object in the article of food, is wholesomeness: wild cattle feed entirely on the green vegetables which they find throughout the year Similar nutriment should therefore, if possible, be procured for tame cattle, in all seasons; but such food can be found only among those plants, which are either constantly green, or arrive at maturity in the winter. Therefore cabbages, turnips, carrots, and the mangel wurzel, are recommended as a winter food So very great is the produce of carrots, that, according to the account of Mr. ARTHUR YOUNG, twenty work horses, four bullocks, and six milch cows, were fed at Partington, in Yorkshire, England, for above five months, with carrots, the produce of three acres; nor did they, during that period, taste any other food, except a little hay. The milk, he farther adds, was excellent, and the refuse fattened thirty hogs, with very little additional food.

Almost every English book on farming extols the great benefit derived from feeding cattle during winter on turnips. In the United States the practice is not adopted of choice, and where an experiment has been made of this food, a favourable opinion of it has not been the consequence. A judicious friend, W R. who successfully follows grazing, lately had an abundant crop of turnips, which he could not dispose of; he therefore determined to feed his cattle upon them. The beasts were put up in October, and were fed until February, upon turnips. They did not thrive as he expected; on the contrary, they rather lost flesh; but on changing the food to hay, Indian corn meal, and chopped potatoes, they soon fattened. Whence is the cause of this different result in Europe and the U States?

II. *The Breeding of Cattle.*

[I have struck out a great deal of what I consider as unmeaning and insignificant observation, by Dr. WILLICH, on this subject, inapplicable to the state of this country. The whole art of breeding animals and vegetables for particular purposes, may be included in this direction; *choose those animals or vegetables to propagate from, that possess the qualities you wish to propagate, in the*

greatest perfection. Volumes may be written to illustrate and confirm this advice, but nothing can be added to it substantially.

As to the common advice of crossing the breed, I take Mr. BAKEWELL's practice to be the best; *never quit one good breed, till you can pick out from a better.* By following this plain method for a few generations, always seeking for those parents that have the points you want, in the greatest perfection, you will certainly improve your stock, whether of racers, cart-horses, turnips or strawberries.—T. C.]

Cattle may be much improved by *crossing the strain*, or breed

In keeping live-stock on grain, as well as grass-farms, their kinds, size, and number, in proportion to the means of subsistence, deserve unremitted attention; as likewise the modes of keeping them, and saving their manure. It is asserted, that English cows require, in general, from one to two acres of pasture: this is mostly *made*, by sowing grass-seeds after the ground has produced crops for many years, being both ameliorated and exhausted under manurings and good tillage. Such land continues several years afterwards in grass, which is carefully cleared of brambles and strong weeds During this time, the cows drop their dung, which is exposed on the ground, to be exhausted by the united effects of the sun and wind; and which, according to the old system, is supposed to benefit the soil in a considerable degree. But the good effects of this irregular method of fertilising our pastures is, in a great measure, counteracted by the continual treading of the cattle; and we have every reason to hope that such wasteful and unprofitable modes of manuring will, sooner or later be relinquished, and better practices be generally adopted. See IRRIGATION.

These inconveniences may, however, be obviated, and the cattle supported at less expense, by *soiling* them, a practice now becoming general in England, and which cannot be too strongly recommended. By this means, very few or no division-fences are required: instead of one acre and a third, (the usual proportion to one head) one-fourth part will suffice for the subsistence of a beast during the six warmer months; the whole of their manure is well preserved, and given to the soil, where it is most wanted, and in the best condition; the land is not trodden in, and the cattle always ready for immediate use. They are also kept more cool, are less tormented by flies than if pastured, acquire good coats, and full flesh; though they consume a much smaller quantity of food. Many persons, however, may object to the laying aside of division-fences, that bad seasons will happen, when no grass can be cut and carried in, on account of heavy rains, or cold winds, which retard its growth; and, consequently, that it will be requisite to have some fields divided off, in which the cattle may find pasturage. To these it may be answered, that it will always be found a more safe and profitable plan to keep a quantity of hay in store, to meet the contingencies of unfavourable seasons, and to feed beasts in the manner practised in towns, where they frequently are kept on hay and straw, during the whole year, and thrive exceedingly well.

Hard or light stocking of pasture ground.—Some persons contend that the pastures ought to be stocked very lightly; alleging, that although much of the produce is thus allowed to run to seed, which the beasts will not eat, and which, of course, is trodden under foot, and rotted by rain, and thus wasted; yet experience, they say, proves, that a greater profit will be thus derived from it, upon the whole, than by any other practice, on account of the superior thriving of the animals.

Others pretend, on the contrary, that light stocking of grass land is a practice highly to be condemned; as it tends not only gradually to diminish its produce, but also to encourage the growth of coarse and unprofitable grasses, which greatly deteriorate the pastures, and that hard stocking of grass lands, especially those of a rich quality, is an indispensible requisite of good management.

These two opinions, so diametrically opposite to each other, and which are equally maintained by sensible men, clearly proves the embarrassment to which they are subjected, in consequence of not having adverted to the circumstances stated above, and many other particulars that require still to be developed, as affecting the economical consumption of the produce of grass-lands.

A third party, who approach perhaps nearer to the truth than either of the above, advise, that mixed stock should be always kept upon the same field: and were the consumption of the foul grass produced by the dung of the animals, the only article to be adverted to

it might be, doubtless, so managed as to correct this evil: but there are so many other circumstances to be adverted to, that it is not easy, by this means, to get them all remedied.

In every field, a variety of plants spontaneously spring up, some of which are disrelished by one class of animals, while they are eaten by some others; and some of which plants, though eaten readily by some animals at a particular period of their growth, are rejected by them entirely at another age. Thus it becomes necessary, not only to have a variety of animals in the same pasture; but also a very particular attention is required to augment or to diminish the proportion of some of these classes of animals, at particular seasons of the year, otherwise some part of the produce will be allowed to run to waste, unless it be hard stocked to such a degree as to retard their thriving

But if a great variety of animals be allowed to go at large in the same pasture, they are never suffered to feed with that tranquillity which is necessary to insure thriving in the highest degree. One class of these wishes to feed, or to play, while the others would incline to rest. They thus mutually disturb and tease each other: and this inconvenience is greatly augmented, if penning of any sort be attempted. From these considerations, the practice of intermixing various kinds of stock very much together, is found to be productive of evils, in many cases, greater than those which result from the waste of food this practice was intended to prevent. And though there is no doubt, that by hard stocking, the grass will be kept shorter, and consequently will be more palatable in general to the animals which eat it, than if it were allowed to run to a great length, and that thus even unpleasing patches may be consumed; yet as animals, which are to be fattened, must have not only sweet food, but an abundant bite at all times, to bring them forward in a kindly manner, it seems to be nearly impossible to obtain both these advantages together in the practice of pasturage.

Many arguments tend to show that the practice of *soiling* would be, in general, highly economical. This subject may be considered under the following points of view:

First.—The greater or less variety of plants that would thus be consumed, and consequently prevented from running to waste.

Second.—Whether stall feeding, or grazing, tend most to promote the health and comfort of the animal?

Third.—The proportional quantity of manure obtained by the one or the other practice.

Fourth.—The quantity of herbage that will be afforded from the same field, under the cutting or grazing system.

Under *the first* head. If the consumption of the plants be the object principally attended to, it is plain the benefits will be great: for experience has clearly proved, that there are many plants greedily consumed by beasts, if cut and given to them in the house, which never would be touched by them when growing in the field. Of this nature is the *dock*, *cow parsley*, (*chaerophyllum sylvestre*,) *thistles*, *nettles*, and many other plants. Upon what principle it should happen, that these plants should be so readily eaten, when thus given, while they are totally rejected when in the field, I cannot say: but that they are thus eaten, without reluctance, even when the animal is not hurtfully hungry, is evident from this circumstance, that the beasts often fall greedily to these at the moment they are brought in from the field, even before they have had time to become hungry after they had come in. Thus fewer plants will be rejected or suffered to go to waste.

In *the second* place. It is well known that many of even the best kinds of grasses, which, when young, form the most palatable food for these creatures, if once suffered to get into ear, are disrelished so much as never to be tasted by them, unless to prevent starvation, and as in most pasture fields many of these grasses get into ear from various causes, all the produce of these plants is inevitably lost to the farmer But if cut down by the scythe in proper time, not one of these is ever suffered to get into that nauseating state; and consequently no waste is sustained from this cause.

Thirdly—When animals are suffered to go upon the field, many of the plants are trodden under foot by the beasts, and bruised, or in part bruised, in the earth; in which state they are greatly disrelished by animals, and are suffered to run to waste; which never could take place, were the practice of cutting adopted. And,

Lastly, on this head. Those few plants which are totally disrelished by one class of animals, so as to be rejected by them even in the house, will not

from this circumstance, become less acceptable to others, but much the reverse. Food that an animal has breathed upon for any considerable time, becomes unpleasant to other animals of the same class; but not so to those of another species: it seems indeed thus to acquire for them a higher relish. Even greater defilement by one animal, seems to render food more acceptable to others: for straw, that in its clean state has been rejected by cattle, if employed as litter for horses, acquires a relish for cattle that they search for with avidity. Hence it happens that the sweepings of the stalls from one animal, furnishes a dainty repast for those of another kind: which can easily be shifted from one to the other, if the plants are consumed in the house, but which must have been lost in the field. We shall soon have occasion to show that this peculiarity may be employed to answer another useful purpose.

Under head the *second*. If *the health and the comfort of the animal* be chiefly adverted to, the balance will be clearly in favour of the cutting system, when compared with that of pasturing. It is well known that when animals are exposed to the sun, in the open air, they are not only greatly incommoded on many occasions by the heat, but also are annoyed by swarms of flies, gnats and hornets, as well as the terrible gad-fly, which drives them into a state of perturbation little short of furiosity, which must obviously tend to retard their thriving. At other times they are hurt by chilling blasts, or drenched by cheerless rains, which renders their situation very unpleasing and greatly retards their feeding, as is well known.

Under proper management, in well constructed stalls, all these evils would be alike removed; and they would be kept, perpetually, in a proper state of coolness, tranquillity and ease, so as to make the same quantity of food go farther in nourishing them, than it otherwise could have done. They would also be prevented from licking up snails, worms, and other noxious creatures, among their food, which by pasturing they are apt to do, when they feed to those times of the day, or night, when these creatures crawl abroad. This would be entirely avoided by cutting the grass at those times of the day when none of these are to be found. Thus, lingering diseases might often be avoided, which always retard the thriving, and often prove totally the destruction of the animal. And, *lastly*, by giving an opportunity of administering dry and nourishing food, along with the soft and succulent, where circumstances requires it, in any requisite proportions, and by varying the tastes, so as to provoke an appetite, not only the health, but the thriving of the creatures, would be greatly augmented beyond what they otherwise could have been.

Under the *third* head. If *manure* is to be chiefly attended to, there can be no comparison between the two modes of consumption. This is so greatly in favour of stall feeding, that it would be idle to spend time in searching for proofs of a proposition, that may be considered as self evident.

In the *last place* If the *quantity* of herbage produced from the same field be adverted to, it will be found to be equally in favour of the cutting system. It is well known, that all animals delight more to feed on the young fresh shoots of grass, than those that are older. Hence it invariably happens, that those patches in a pasture field that happen to have been eaten once bare, in the beginning of the season, are kept very short ever afterwards throughout the whole of that season, by the creatures delighting to feed upon them in preference to the parts of the field that have got up to a greater head; so that these last are suffered to remain, in a great measure, untouched, throughout the season. It is not however, in general known, that grass, even the leafy parts of it, when it has attained a certain length, becomes stationary; and, though it will retain its verdure for some months in that state, makes no sort of progress whatever; whereas if it had been cropped down frequently, it would have continued in a constant state of progress, advancing with a rapidity in a great measure proportioned to the frequency of its being cropped. For experimental proofs of this fact, see Essays on Agriculture and Rural Affairs, vol 2. disquisition 5. Nor has the diminution of produce that must thus be incurred, ever been adverted to by persons who are interested in it; nor have these circumstances entered in any respect into their estimation. From my own experiments and observations, however, I am satisfied that, in some cases, the actual produce of the same field, by a judicious management *in this respect*, compared with bad management, may be augmented *four-fold* in the same season. It is owing to

this circumstance, though the reason of the fact has not been understood, that hard stocking of pasture lands has been found to enable the same field to sustain a much greater weight of stock, than it would do when lightly stocked. But under no system of management can the evil of unequal cropping of land under pasturage be avoided, unless it be by a destructive degree of hard stocking, which must be avoided where the animals are expected to thrive. By cutting with the scythe frequently, so as to keep the grass always short, and therefore in a state of continual vigorous vegetation, all these evils are avoided The quantity of produce will be raised to the *maximum* that the land, in its present state, is capable of producing, while the stock to be fed by that produce need not be in the smallest degree stinted in point of food.

Under every point of view, then, that this question can be considered, we are forced to conclude, that the practice of cutting of grass, and consuming it green, in all cases where the ground is in a state that can admit of it, when compared with that of pasturage, appears to be so greatly economical, that the particulars under which that mode of management can be practised, and the peculiarities affecting it, deserve to be much more minutely investigated, than they ever yet have been.

In confirmation of the justness of this conclusion, it is now universally admitted as a fact, that a crop of red clover, when cut and consumed in the house green, in all cases, will go *at least* twice as far, when cut, as when pastured upon. As every person, who has tried the experiment, agrees, that the saving, by cutting this crop, is very great, that practice has of late years begun to prevail very much; though reason has not yet been able to stem the torrent of ancient prejudice, so as to render it entirely universal.

Since the former edition of this work was printed, I (Dr. W) have met with a publication by Dr. Thaer, physician of the *Electoral Court of Hanover*, and published in the first volume of *Communications to the Board of Agriculture*, page 376, in which I am happy to find, that the conclusions I have drawn above, by reasoning from the few facts that have fallen under my own observations, have been confirmed by experience of Baron De Bulow, and others; which have proved, as Dr. Thaer says, that the following facts are incontrovertible.

"1st. A spot of ground, which, when pastured upon, will yield sufficient food for only one head, will abundantly maintain four head of cattle in the stable, if the vegetables be mowed in proper time and given to the cattle in a proper order.

"2d. The stall-feeding yields, at least, double the quantity of manure from the same number of cattle; for the best and most efficacious summer manure is produced in the stable, and carried to the fields at the most proper period of its fermentation; whereas, when spread on the meadow, and exhausted by the air and sun, its power is entirely wasted.

"3d. The cattle used to stall-feeding will yield a much greater quantity of milk, and increase faster in weight, when fattening, than when they go to the field.

"4th. They are less subject to accidents, do not suffer by the heat, by flies and insects; are not affected by the baneful fogs that are frequent in Germany, and bring on inflammations; on the contrary, if every thing be properly managed, they remain in a constant state of health and vigour."

Grass lands, if constantly cut, and regularly manured, are not deteriorated, but dung dropped upon land by cattle pasturing upon it, does not, except in a small degree, tend to enrich it.

It is suggested that cattle confined in stalls will be too much heated during the summer months, and their health affected: but stalls may be constructed so as to secure the animals from the flies, and enable them to enjoy air. An attention to both these particulars is indispensable to the preservation of their health, and the speedy fattening of the animals.

The grass must be cut in the morning for the evening food, and in the afternoon for the morning mess; the afternoon crop must be carried to the barn, and spread to exhale its superfluous moisture; and in rainy weather, both crops must be taken off the ground. Attention must however be paid to the due proportion to be cut, and until the fact be ascertained, Mr. Bordley recommends to measure each mess, and chalk down how much a basket, or cart body, holds of the articles in weight. The practice will at least have a tendency to teach servants to observe *method*, the value whereof is considerable in all business. On the supposition that 75 lbs. of green clover alone, will suffice for one beast, (and thirty-two heads are to be fed) 1,200 lbs. will be

cut twice a-day.' Eight acres cut four times in the season of soiling, will give one cutting in six weeks; or nearly thirty perches are cut daily. A man and boy may perform all the work and attention in soiling the above number.

In cases where it is impossible to *soil*, the next best method is to make a proper division of the land, and to proportion the number of head to the quantity of acres. Cattle should be changed from a field whenever the grass is eaten short: otherwise they will fall in flesh, and additional time and grass will be required to bring them to their former standing. It is only by regular full feeding, that cattle will soon be brought to look well, and to be fit for market.

Where a small number of cattle are fed, and it is necessary to turn them into a clover field in the close of the day, a man should watch and turn them out the moment they are satisfied, otherwise they will lie down, or stroll about, and by blowing on the grass, will cause great waste.

Cattle fed in the meadows south of Philadelphia, are generally kept one year before they are sold. They are *pastured* one summer, and then stall-fed upon hay, and 4 quarts of meal of Indian corn, *(Zea Mayz)* and 3 quarts of chopped potatoes 3 times a day. In the spring and early in the summer, they are sold. In some cases they are fed on hay alone, in which case they require two tons per head; but having short feed as above, each requires but one ton. Hay composed of white clover and timothy (*phleum pratense*), fattens quickest. One grazier thinks that the second crop of blue grass and clover is best to make hay; but a farming friend thinks that this mixture is not nourishing, though cattle will eat more of it. In stall-feeding cattle, it is a common practice to give a certain mess every day without regard to any circumstance, but an experienced feeder deems this practice absurd, and justly observes that a bullock will eat with a much keener appetite on a clear cold day, than in warm damp weather; his mess ought to be proportioned accordingly. By giving the same quantity every day, the animal may be induced to over-eat itself, and many days may elapse before he will recover his appetite. By this delay he may fall away, and time will be required to bring him to his former good flesh. The waste hay, or that made from grass mowed after the cattle, is used commonly to feed the stock when the winter sets in; the best hay being reserved for the spring before the beasts are turned out to grass. A handful of salt is broad cast over every load as packed in the loft, and so grateful is this condiment to them, that they have been observed to prefer poor hay salted, to good hay unsalted.

The economical Flemish and German practice of boiling the potatoes, corn, &c. deserves to be followed.

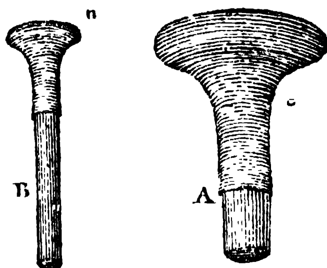
[Even with the ground, near the stables, set an iron boiler with an oaken rim round it, sufficiently wide to admit a hogshead to be rolled over the boiler, which is furnished with a fire underneath and a chimney. Bore holes in the bottom of the hogshead; fill it with washed potatoes; (washed at the pump trough with a birch broom.) Cover the top of the hogshead; the steam from the boiler, will dress the potatoes in half an hour. When done, roll off the hogshead of steamed potatoes, and roll on a fresh hogshead.—T. C.]

III. *The Diseases of Cattle.*

No distemper is perhaps more common among these useful animals, than that of being swoln, that is, *blown* or *hoven*, as it is termed by farmers. It arises from eating too greedily of any succulent food, such as turnips, clover, which is a dangerous food for horned cattle. For this fatal malady, various remedies have been tried, with more or less success, of which we shall select the most effectual and expeditious. The general practice is, to make an incision with a pen-knife in the body of the affected animal, (under the short ribs,) and a tube of ivory, bone, or smoothed elder put in, in order to give vent to the confined air: the wound is then covered with a common or adhesive plaster, to prevent external cold from penetrating it; and thus the danger, in general, is speedily removed. But, where it is practicable, it surely behoves us to employ more gentle remedies for the alleviation of this disorder: we, therefore, extract with satisfaction, the following recipe from the 33d volume of the *Annals of Agriculture;* where it is announced as a specific for hoven cattle, even in the most desperate cases; effecting a cure within the short space of half an hour. Take three quarters of a pint of olive oil; one pint of melted butter, or hog's lard; give this mixture by means of a horn or bottle; and if it does not produce a favourable change in a quarter

of an hour, repeat the same quantity, and walk the animal gently about. For sheep attacked with this malady, the dose is, from a wine glass and a half to two glasses. Besides these remedies, instruments have been invented for the purpose of relieving blown cattle: two of these contrivances we shall describe, as being particularly distinguished for the ingenuity of their construction, and the speedy relief they afford. The first is a flexible tube, invented by the celebrated Dr. MUNRO, Professor of Anatomy at Edinburgh: it consists of iron wire, about one sixteenth of an inch in diameter, twisted round a rod three eighths of an inch in diameter, and made of polished iron, in order to give it a cylindrical form; the wire, after being taken off the rod, should be covered with smooth leather. To the end of the tube, which is intended to be passed into the stomach, a brass pipe two inches long, of the same size, or rather larger than the tube, is to be firmly connected: and to prevent the tube from bending too much within the mouth, or gullet, an iron wire, one eighth of an inch in diameter, and of the same length as the tube, is put within it, but afterwards withdrawn, when the tube has entered the stomach. As Dr. MUNRO has ascertained that the distance from the fore-teeth to the bottom of the first stomach of a large ox, is about six feet, the tube ought, therefore, to be at least two yards long, that it may operate effectually in the largest oxen. When the instrument has been introduced into the stomach, it may remain there for any length of time, as it does not obstruct the respiration of the animal: the greater part of the condensed air will be speedily discharged through the tube; and, should any ardent spirits, or other liquor calculated to check the fermentation, be deemed necessary, it may be safely injected through this pipe. In short, the flexible tube here described, has been found of infinite service in saving the lives of cattle, and especially of sheep, when subject to similar disorders, or any other swelling, peculiar to these creatures.

Another *Instrument for relieving hoven cattle and sheep,* is that contrived by Mr. RICHARD EAGER, of Graffham farm, near Guildford. Its peculiar simplicity, and great utility, have induced us to subjoin the following representation.



A, A, is the knob of wood, and part of the cane to which it is fastened, of a proper size for oxen: the length of the cane should be at least six feet.

B, B, is the knob of wood and part of the cane, calculated for sheep, and the length of which ought to be about three feet.

When any beast is blown or hoven, Mr. EAGER directs a person to lay hold of it by the nostril, and one horn, while an assistant steadily holds its tongue with one hand, and pushes the cane down its throat with the other. Care, however, should be taken, not to let the animal get the knob of the cane between his grinders, and also to thrust it down far enough; because its whole length will do no injury. As there will be found an obstacle at the entrance of the paunch, the cane must be pushed with additional force; and, as soon es a smell is observed to proceed from that place, and the animal's body sinks, the cure is performed, and Nature will complete the rest.

Mr. EAGER justly attributes this disorder to the superabundance of air introduced into the stomach, by eating too large quantities of succulent food, which occasions a greater than natural portion of wind to ascend from the

paunch of the beast. This forces the broad leaves before the passage, at the entrance of the stomach; and these leaves prevent the wind from passing upwards in its regular course. Thus the paunch immediately begins to swell: the heat of the body rarefies the air, so rapidly as to impede the circulation of the blood, and the animal, whether bullock or sheep, unless instantaneous relief be procured, expires in half an hour.

In justice to Mr. EAGER, we cannot omit to mention, that the *Society for the Encouragement of Arts, &c.* in 1796, voted to him a reward of fifty guineas, for communicating to the public his simple, yet effectual, method of relieving cattle thus dangerously affected.

The Rev. Mr. E. PARSONS, of East Haddam, Connecticut, describes a disease in the *Medical Repository New-York*, vol. 1. which has been very destructive to horned cattle in Connecticut for ten years past. It is chiefly confined to cattle under three years. Cows are sometimes attacked, but oxen rarely. It has been most fatal to calves in autumn and to yearlings in May and June. The largest and highest fleshed are most liable to the disease.

The vulgar name for the disease is "*The Mortification.*" The symptoms are, unwillingness to move, a soft swelling in the leg, shoulder, flank, side, but oftener in the back and region of the kidneys. In the course of six, twelve, or twenty four hours, life terminates with little expression of pain. The stink before death is intolerable. Upon skinning, the swollen spot is found to contain a jelly, and black blood.

The cause of this disease is supposed to be too much fulness, or *plethora*, as it proves destructive to cattle after a change of pasture or fodder, from bad to good. Many calves have died after feeding in the fields of grain.

The remedies are chiefly of the preventive kind, such as bleeding, or a change of pasture of a better quality, and care not to permit a sudden change, from bare to full bite. One person bled copiously in the neck, gave the animal his own blood to drink, which purged; and then made an incision in the swollen spot, took out the jelly and gore, and filled the cavity with rum and salt; after which the recovery was gradual. Three head of cattle thus treated, recovered: on all the rest this treatment had no effect, either good or bad.

[For the *yellow-water*, bleed and purge.—T. C.]

[For the *hollow-horn*, saw off the diseased part. Dress with turpentine; keep the animal warm, and do not starve him. It is a disease owing to want of food, and exposure to cold.—T. C.]

A disease which originally appeared in a drove from North Carolina, in the autumn of 1796, spread devastation throughout the country among the cattle as it passed. Dr. MEASE first heard of it near Columbia, on the Susquehannah, where the drove remained *one night* in a ploughed field. The stock of the farm were seized in a few days afterwards, and many perished. At the same time the beasts in the drove appeared *perfectly well*. The disease was traced down to Derby, 8 miles S. W. of Philadelphia, where great havoc was occasioned by it. The symptoms were first, disinclination to food, inability to stand, tumbling, laborious breathing, and deep groaning: bloody urine was sometimes discharged. Costiveness, in general, was a symptom. The blood was dissolved when drawn. No remedy was found effectual.

The circumstance attending the above mentioned disease, suggests the propriety of keeping drove cattle separate from an old stock for some time, and of permitting the latter to mix with the former by degrees, in order to see whether a disease appears.

The little attention that has hitherto been paid to the diseases of cattle in the United States, is a matter of very serious concern. It frequently happens that an epidemic rages among horned cattle with great violence, and no more information is communicated respecting it, than what is contained in a newspaper paragraph, though the country abounds with men of education, fully capable of recording a good account of the disease. Such negligence is highly reprehensible, and by continuing it, we shall always remain stationary in our knowledge of the diseases of cattle. The symptoms ought to be described, whether, the complaint may or may not be cured and the various remedies stated, in order to direct the mode of cure, or prevent the loss of time on future occasions. Many thousands of dollars were lost by the fatal disease mentioned above, and noticed first among the North Carolina drove, and yet no other account of it is to be found, except the imperfect one here

given. In Europe, the diseases of cattle are deemed worthy of particular attention by men of science, and professorships are endowed in many universities, for the express purpose of having the physical economy of all domestic animals properly examined. The advantages of these establishments are often perceived, and no time ought to be lost in following the example in the various colleges in the United States. It is well known that England was indebted to a physician (Dr. LEDYARD) for the stoppage of the ravages of a wide spreading epidemic which raged among the horned cattle between 1750 and 1760

Cattle are also sometimes affected by diseases of the hoof; in consequence of feeding upon hay made of the bog meadow grass. Such a disease was seen by a grazing friend (W. R.) among the cattle in Blooming Grove near Gray Court, New-York, in the winter succeeding the dry summer of 1793. Many beasts lost their hoofs entirely.

A similar complaint was observed by another friend (I. C.) to prevail among cattle from feeding upon the natural grass which comes upon meadows made by banking out the river Delaware, and which are not duly watered. The ends of the blades of the grass become tipped with a black powder similar to rust on grain. Cattle do not relish the grass, and will not eat it unless forced by necessity. Care must therefore be taken to water such meadows at proper seasons.

There are various other distempers, to which the farmer's live-stock are frequently subject; such as the worms, or botts in horses, the mildew, murrain, quarter-evil, rot, scab, &c. among different species of cattle. With respect to the nature and cure of these, we refer to the order of the alphabet: such of our readers, however, as may wish for more minute information on the subject of cattle, will probably be gratified by the perusal of Mr CULLEY'S "*Observations on Live-Stock*," 8vo. a small work that was published a few years since, and is believed to possess considerable merit: also Mr. TOPHAM'S "*New and compendious System on Several Diseases incident to Cattle*," &c. 8vo. 1788; a work containing some valuable hints, and of which a new edition was lately published.

Before we conclude this interesting article of national importance, we shall add a few general remarks, tending chiefly to preserve the health, and improve the physical properties of cattle. It is admitted, by all enlightened breeders, that *cleanliness* is one of the most essential requisites to the prosperity of those animals; and we may venture to add that, in this respect, a degree of attention ought to be paid, little inferior to that bestowed on the human frame. Hence, frequent washing, especially after hard labour; friction with proper brushes, and curry-combs, gentle-walking after a fatiguing journey; and the immediate removal of litter, both from the stalls, and farm-yards, should not be neglected. But, alas! let us look around in the vicinity of London, and inspect the filthy situation of cows, in general, which are kept in a state worse than hackney coach horses, for the *sole* purpose of giving the greatest possible *quantity* of milk, without regarding its quality; every judicious person will shudder at the picture. And yet, we derive from these beneficial brutes a considerable part of our daily sustenance, especially for children, and those persons whose organs of digestion have not been impaired by the habitual use of fermented, spirituous, or intoxicating liquors. See MILK.

In a preceding part of this work we have pointed out the great necessity of supplying CATTLE with sufficient quantities of common salt; and for the reasons already stated, we are of opinion, that ALL kinds of cattle, especially *sheep*, would be much benefited by the continual use of this simple and natural spice which eminently conduces to the digestion of succulent vegetables, and is almost a specific for preventing the effects of flatulence. *Salt* may be given in excess: but it *enables the farmer to increase his live-stock, as it augments the nourishment of the food eaten, in proportion to the quantity of saline matter.* It is also said greatly to improve the wool in quality, as well as quantity. Hence it ought to be given to sheep, and cattle of every description:—Lastly, Mr. BORDLEY relates a fact worthy attention. About sixty years ago, he learnt, from a country farrier, that, "once or twice a week, giving salt to horses, effectually secures them against *botts*."(Qu ?) ever since that period, he has experienced the good effects of this management; and adds that, during twenty years residence on his farm, at Wye, in Maryland, he always kept upwards of fifty horses on the banks of a river, containing *salt-water*, and never met with a single instance of that disease.

[A quarter of an ounce of salt per day to sheep; and one ounce per day to cows and oxen, is an allowance ample enough. But it will not either cure or prevent the botts. The practice of salting hay, deserves to be universally recommended.—T C.]

CAUDEX, a botanical term, signifying, in general, the stem, or trunk of a tree. It is properly that part of plants which joins together the *plumula*, or leaf, and the *radicle*, or root fibres; and which is called the caudex, by LINNÆUS, when applied to entire plants. He consequently divides it into the ascending and descending body of the vegetable: the former contributes to the formation of the trunk, the latter to that of the root. In herbs and shrubs, the caudex is denominated *Caulis*, or the stalk.

Dr. DARWIN observes, that, in herbaceous plants, the caudex is generally a broad, flat, circular plate, from which the leaf-stems ascend into the air, and the radicles, or root-fibres, descend into the earth. Thus, the caudex of a plant of wheat lies between the stem and the radicles, at the basis of the lowermost leaf, and occasionally produces both new stems and radicles, from its sides; whereas that of a tulip is situated under the principal bulb, and generates new, though smaller ones, in the bosom of each bulb-leaf, besides one principal, or central bulb—the caudex of the orchis, and of some species of the ranunculus, lies above their bulbous roots; but those of the buds of trees constitute the longitudinal filaments of the bark, extending from the *plumula*, or apex, of the bud on the branch, to the base of it, or its root-fibres, beneath the soil.

The elongation of the caudexes, which takes place in the buds of trees, says Dr. DARWIN, is analogous to what happens to some herbaceous plants, as in wheat: when the grain is buried two or three inches beneath the soil, an elongation of the caudex occurs almost up to the surface, where another set of fibrous roots are protruded, and the upright stem commences It is the same with tulip-roots, and also those of many other vegetables, when planted too deep in the earth.

This caudex of the buds of trees, not only ascends, as before described, but likewise descends from each bud to that above it; as on the long shoots of vines, willows, and briars; in this respect, resembling the wires of strawberries, and other creeping plants. Thus the caudex of perennial herbaceous plants consists of a broad plate, buried beneath the soil, to protect it from the frost; while that of the buds of trees is furnished with a long, vascular cord, extending from the bud, on the branch, to the radicle, beneath the earth, and enduring the winter frosts, without injury.

When treating of *vegetable generation*, and the organs of reproduction, Dr DARWIN, in his "*Phytologia*," mentions a remarkable *animal* fact, illustrative of this curious and important subject: Many insects, such as the common earth-worm, and the polypus, are said to possess so much life, throughout a great part of their system, that they may be cut into two or more pieces, without destroying them; as each part will acquire a new head, or a new tail, or both; and the insect thus become multiplied. How exactly this is resembled by the long caudex of the buds of trees, which possess such vegetable life, from one extremity to the other, that when the head, or plume, is lopped off, it can produce a new plume; and when the lower part is cut off, it will generate new radicles; and thus may be wonderfully propagated, See also BUD, BULB, and LEAVES.

CAUKING, or CAULKING A SHIP, is driving a quantity of oakum, into the seams of the planks. After the oakum is driven very hard into these interstices, it is covered with melted pitch to keep the water from rotting it.

CAULIFLOWER, the *Botrytis* L a variety of the *Brassica oleracea*, or sea-cabbage, a native of the Isle of Candia, but, of late years, has been so far improved in Britain, as to exceed, in size and flavour, those flowers which are produced in most parts of Europe.

Cauliflowers are raised from seeds, which ought to be saved only from large and white flowers; as, without this precaution, they will not prosper. The seeds should be sown in March, in a rich, but not too dry soil, where the young plants, on their first sprouting out, may be sheltered from the evening frosts, which usually happen at that season. About the middle of April, while in their first leaf, they should be transplanted into a nursery, five or six inches apart; where they must remain till the latter end of May, or the beginning of June, when it will be proper to remove them to those spots, in which they are intended to blossom. The best time for this purpose, is in wet weather, which will make them strike root

quickly; but if the season be dry, holes should be dug in the ground, at about three feet distance, which must be well watered, previously to settling the cauliflowers. By these means, and also by watering them frequently, during warm weather, the plants will grow rapidly, and produce large flowers in autumn. It sometimes happens that, notwithstanding these precautions, they will not flower till after Michaelmas; in which case they must be dug out, together with the earth at their roots, and set upright in a green-house, or other warm place, where the blossoms will increase in size, and be fit for use in winter. But, in order to have cauliflowers in the summer, a different mode of cultivation must be pursued. To effect this, the seed should be sown in the beginning of August, on an old cucumber, or melon-bed, over which a little mould should be sifted, about a quarter of an inch thick; this should be shaded with mats, and occasionally watered, to prevent the sun from injuring the plants. About a month after sowing, they will be fit to "prick out," when they should be set four or five inches apart, either under a south wall, to remain there till spring, or in the places where they are destined to blossom, and covered with glass bells during the severity of winter. Thus, and especially by the latter method, the plants will, in the spring, become firmly rooted, and consequently produce larger blossoms than those which are set in that season.

The cauliflowers planted out at Michaelmas, will blow about three weeks sooner than those set in the spring; nevertheless, it is necessary to make plantations in both seasons, that there may be a constant succession of crops. Care should, at the same time, be taken to set them where they may not be exposed too much to the sun, and also to water them well, which will contribute greatly to their growth: M. Bechstein, a German writer, however, asserts that they will thrive most luxuriantly in the open fields. As soon as the blossoms begin to appear, it will be requisite to break off the large leaves, and lay over the flowers, in order to shelter them from the rain, and the scorching heat of the sun, which would otherwise cause them to turn yellow.

As cauliflowers are apt to be damaged by the wind, and sometimes to be blown up by the roots, particularly during the months of March and April, they require to be safely protected from its violence. For such plants, therefore, as blossom early, and have large, close flowers, we would recommend the practice adopted in some parts of England, namely, of allowing some of the most forward ones to remain for seed, and tying them carefully to stakes, to prevent their receiving any injury from the wind. As soon as the pods are full grown, and the seeds have arrived at maturity, the whole stalk must be cut off, and dried, previously to the seeds being rubbed out; as they are liable to be shed, if left upon the plants, till the seed-vessels are dry.

Among the succulent plants produced in our climate, this doubtless is one of the most nourishing, and likewise the best adapted to tender organs of digestion, especially in valetudinarians and invalids: such persons, however, ought to eat it with the addition of some aromatic spice, such, as pounded cardamoms, or caraway, or a small proportion of bread.

To prepare cauliflowers. Let the cauliflowers first be par-boiled; next they must be immersed in cold, hard-water, for some time, till they be nearly wanted for the table: thus, on being boiled for a few minutes, they will become more firm and crisp than if they had been cooked in the usual manner.

CAUSE, that from whence any thing proceeds, or by virtue of which any thing is done: it stands opposed to effect. We get the ideas of cause and effect from our observation of the vicissitude of things, while we perceive some qualities or substances begin to exist, and that they receive their existence from the due application and operation of other beings. That which produces is the cause; and that which is produced, the effect; thus fluidity in wax is the effect of a certain degree of heat, which we observe to be constantly produced by the application of such heat.

CAUSEWAY, a common, hard, raised road, made for the convenience of travelling.

CAUSTIC, in chemistry, a fixed alkaline salt, deprived of its carbonic acid, and most of its water, by means of quick lime, evaporation and fusion. The alkali used for this purpose is generally pot-ash, and the form that is chosen is the lixivium of the soap-boilers, which is evaporated to dryness in a copper or silver vessel, fused in a crucible, poured into a basin, and when solid cut into small pieces, which must

be kept in a bottle well closed to prevent deliquescence. If a piece of this caustic be applied to the skin, it corrodes it in about half or three quarters of an hour, producing a painful eschar like that which is occasioned by burning; and forming most probably a saponacious compound with the fat-parts of the skin, or flesh.

CAUSTICS, in medicine, are remedies, the operation of which resembles that of fire; by destroying the texture of the part to which they are applied, and converting it into a substance not unlike burnt flesh.

Those bodies which possess causticity, are, when taken internally, mortal poisons: so powerful is their action, in general (for instance, arsenic), that cautious physicians hesitate to prescribe it, even externally. There are, however, several others, which may be in a great measure divested of this deleterious quality, such as the nitrous acid, or aqua fortis: lunar caustic, or a solution of silver in nitrous acid; common caustic, or pure kali; either of which are daily and successfully used, especially for extirpating fungous flesh, removing warts, &c. See CAUTERY.

The causticity of bodies depends, principally, on the state of the saline and acid matters which they contain. When the latter are concentrated and attached to the substances with which they are combined, they possess great activity and are corrosive or caustic. In this manner, both fixed and volatile alkalies, though already caustic, acquire that property in a far greater degree, by being mixed with quick-lime; as this substance deprives them of a portion of unctuous and inflammable matter, and divests them of all their fixed air, which binds and restrains their saline principle.

The late Dr BLACK, when treating on this subject, observed that the compounds produced by the union of metals with acids, are in general corrosive. Many of them, when applied to the skin, destroy it almost as soon as mineral acids; and some of the most powerful cauteries are made in this way. Others are supposed to be more acrid than the pure acids themselves, and produce apparently more powerful effects, when taken internally. Thus, a person may swallow ten or twelve drops of spirit of salt, without feeling any inconvenience; but the same quantity of acid, previously combined with silver, quicksilver, copper, or regulus of antimony, will throw the whole body into violent disorder, or even prove fatal, if taken in one dose.

Caustics are not at present in general use; they are, however, applied occasionally in abscesses, to produce an orifice, and to give vent to the suppurating matter; as likewise to make issues in parts where incision is difficult, or dangerous, on account of the contiguous blood-vessels.

[Causticity depends on the strong chemical affinity of any body for the skin or flesh to which it is applied: so that on its application, the part is disintegrated.—T. C.]

CAUTERY, a surgical term given to substances which corrode or burn any solid part of the body: they are divided into two classes, *actual* and *potential*. By the former are understood red-hot instruments, which were much in use among the ancients, and are still employed by several barbarous nations, as their almost only means of curing diseases; but, in the modern practice of Europe, they are seldom resorted to, except for the *firing* of horses and cattle.

Some practitioners, however, cauterise with burning tow, others with cotton, or *moxa* (particularly the inflamed part of a toe, for preventing a fit of the gout); others again with live coals, Spanish wax, pyramidal pieces of linen, &c. But of all actual cauteries, the most expeditious and least painful, is that of strewing on the wound a small quantity of the finest gunpowder, and then setting it on fire: a method which, particularly after the bite of a mad dog, has generally been attended with the happiest effect, while it always renders the operation with the knife unnecessary. [This is not true.—T. C.]

[The French use as an expeditious blister, a cloth fourfold, dipped in water not quite boiling, but just hot enough to raise a blister. According to the part intended to be thus blistered, and the thinness of the cuticle, the water may be from 185 to 200.—T. C.]

CAVIAR, a species of food chiefly imported from Russia: it is made of the hard roes of the sturgeon, formed into small cakes, about an inch thick, and tree or four inches in breadth, but sometimes the whole is loosely packed up in small kegs. It is prepared by taking all the nerves or strings out of the spawn, washing it in white wine vinegar, or spreading it on a table, then salting and pressing it in a fine bag; after which it is put into a vessel perfo-

rated at the bottom, to allow the moisture to run out, if any should remain.

From the latest accounts published by Professor PALLAS, in his *Travels into the Southern Provinces of the Russian Empire, in the years* 1793 *and* 1794 (an English translation of which was published by the editor of this Encyclopedia, it appears that caviar is made of the following three species of fish, caught in the river Volga and the Caspian sea: 1 *Belugas*, or the great sturgeon, of which there are taken annually 103,500: each fish being worth, upon an average, two rubles and a half, or from six to seven shillings sterling: the roe, or caviar, of 1000 sturgeons weighs 4000 Russian pounds, so that this number yields 414 000 pounds, and the value of each *pood*, or forty pounds, is generally computed at three rubles and a half, 2. The little sturgeon, of which there are taken every year 302,000, yielding 724,800 pounds of the roe; and 3 The *Sevrugas*, or *Acipenser stellatus*, L. the annual produce of which is not less than 1,345,000, caught in the different fisheries; and from which 3,228,000 pounds of caviar are obtained: or from the whole number of 1,750,500 fish, 4 million 366 800 pounds of caviar. See also ISINGLASS.

PALLAS observes, that it would be difficult to find in the whole world, a fishery more productive to the natives, and advantageous to government, except that on the banks of Newfoundland. During the long Lent of the Greek Church, and the weekly fast days, which together are at least four months in the year, this fishery affords the principal food to the whole European part of Russia, and its populous capitals. No caviar was exported in British vessels till the year 1781, and only 1040 pounds (Russian weight) of that commodity were sent to England in 1782; but the increase of this trade was so rapid, that in the following year, 46,040 lbs.; in 1784, 64,480 lbs; in 1785 and 1786, above 40,000 lbs.; in 1787, nearly 64,000 lbs; in 1788, 160,000 lbs.; and in 1789. not less than 450,160 lbs.; but in 1790, only 1000 lbs.; and in 1792, 151,240 lbs. were shipped in English vessels. The exportation to Italy has also amounted to upwards of 400,000 lbs. during the last-mentioned years, exclusive of about 120,000 lbs. to other countries, and a still larger quantity through the ports of the Black Sea, and that of Azov.

At present, the annual value of the sturgeons caught in the waters of Astrakhan, and the Caspian sea, amounts to 1,760,405 Russian rubles; a great part of which is paid in British money, for the articles of isinglass and caviar. These fish proceed in shoals to the mouth, and a considerable way up the current of rivers, without the least apparent diminution of their numbers. As the Persians eat no sturgeon, the fisheries of the Sallian are rented by Russians, who, during the spawning season, take 15,000 large fish in one day with the hook, at the weirs formed across the water: nay, it is remarkable, that if the fishermen be accidentally prevented from working but for a single day, the fish accumulate in such numbers at the weir, as to fill the whole channel, so that the uppermost appear with their backs above water, in a river not less than 28 English feet deep, and 60 fathoms wide. But those injudicious fishermen, after having collected the roes for caviar, and the air-bladders for isinglass, throw the body of the fish into the sea as useless. See MANURE.

As the sturgeon abounds in the rivers of the United States, caviar might be easily made in immense quantities. [It *has been* made very good from the roe of the sturgeon in the Philadelphia market.—T. C.] At present the roes are thrown away; the young sturgeon is pickled in Virginia, and deservedly esteemed.

CAYENNE PEPPER, one of the most heating and stimulating spices with which we are acquainted. It is the produce of the *Capsicum Annuum*, L. The plant varies extremely in its fruit. There are several species of Capsicum, most of which are natives of both Indies; but they have been chiefly brought from Cayenne, Surrinam, and the West Indies The well known preparation, called *Cayenne Pepper*, is made from the pods of the smaller sorts of Capsicum.

This powerful spice, in a state of powder, has lately become the companion of the table, and is much esteemed for its flavour, and the quality it is supposed to possess, of promoting the digestion of fish, and other articles of strong food, when taken in moderation. All these stimulating condiments when used to excess, infallibly occasion [illegible] of tone in the digestive organs a[illegible] digestion.

CEDAR, or the *Pinus Cedrus*, L. a species of the pine tree, usually called the Cedar of Lebanon, is a native of Syria. It is an evergreen of the larger [illegible]

kind, bearing roundish cones, with smooth, erect scales, each fruit about five inches long, and four in circumference. The cedar attains a considerable size, and is said to arrive at a greater age than the oak? Beside the numerous articles of the cabinet-maker and joiner, the wood of cedar is also made into moulds for black-lead pencils.

Both the red and white cedar are natives of North-America. The former grows to a height of fifteen or twenty feet. Its berries are smaller than those of the true juniper. It has some seminal varieties, some trees producing, as they grow up, leaves similar to those of the cypress, while others more resemble those of the juniper It is a most durable wood, especially for posts, which, when once fixed in the ground, will stand unimpaired for a century. It was formerly in much request in America, for chests and wainscoatting; but its smell being rather disagreeable, it is now almost entirely disused.

These two celebrated trees are of different genera. The first is the *Juniperus Virginiana*, and the latter, *Cupressus Thyoides*. The red cedar is famous in America for affording the most durable fence-posts, and in Bermuda for its durable and light timber, in the construction of fast sailing vessels. In Virginia and Carolina the berries of this tree are distilled into brandy. The wood is said to preserve furs or woollens inclosed in boxes of it from being touched by moths. The white cedar affords one of the most useful woods in the United States, particularly for covering houses, and other buildings: most of the houses of Philadelphia are roofed with shingles made of this wood * It is preferred to all other wood for the purpose before-mentioned, as well as for fence-rails, boarding frame buildings, and all sorts of inside work of houses, particularly, where paint, varnishing, or paper-hangings are intended; it is preferred to all other wood, for coopers'-ware, such as wooden cisterns, tubs, pails, churns, &c.

This celebrated tree possesses an extensive range on the Atlantic coasts, from New-Jersey southward as far as East and West Florida. Its natural situation and soil is the flat country, near the sea shore and fifty or sixty miles back, where swamps, or a wet morassy soil abounds, but will grow very well if planted in higher land, provided the soil be sandy and moist

* [It is high time this dangerous practice should be exploded. In the infant settlement of a country overburdened with wood, it may be excusable to make wooden roofs, but to use them in a city, is somewhat between madness and folly.—T. C.]

CEILING, in architecture, is the top, or roof, of an upper room, made of plaster, laid over laths nailed on the bottom of the joist of the upper room; or, where there is no upper room, on joists made for that purpose, which are therefore called *ceiling joists*.

Plastered ceilings are in much greater use in England than in any other country of Europe, they are preferable to papered, or other ceilings, as they make a room not only lighter, but also prevent the dust from penetrating through crevices; lessen the noise from above; check the progress of accidental fires; and, during summer, contribute to cool the air See MORTAR, and PLASTER of PARIS

CELERY, a variety of the *Apium graveolens*, L. originally denominated smallage, or parsley. The root, in its wild state, is thick and fibrous; its bushy stalk attains the height of two or three feet, and bears yellow flowers in August· it grows in ditches and salt-marshes, is fetid, acrid, and noxious; but when cultivated in dry ground, it is divested of those qualities, and then called CELERY.

Celery having a solid stalk, is now generally cultivated in and near Philadelphia. The seeds must be sown in March in a hot bed, or in the open ground in a *moist and warm situation*. In six weeks the plants will be fit for putting into trenches, which must be prepared by having some *well rotten* manure put into the bottom. When the plants are about six inches high, they should be transplanted, by which they will gain strength When of a tolerable size, they must be earthed up, taking care to leave out the top of the central stem, or heart, as it is generally termed, above ground. Unless the autumn should prove very warm, the celery will be excellent, and not run to seed.

To preserve this plant during the winter, it should be taken out of the trenches late in the autumn, and put in a warm sheltered spot leaning against a bank of earth, and covered with earth or leaves. The plants must not touch each other

CELLARS, in modern building, are the lowest rooms in a house; their ceil

ings are usually level with the surface of the ground, on which the house is built. They are also situated under the pavement before it, particularly in streets and squares.

On account of the great utility of cellars in preserving wines, ale, &c. various attempts have been made to prevent the generation of damp and noxious air, in subterraneous places.

In Germany, vaults are so constructed that a canal, or passage of communication, is opened from the cellar to the principal chimney of the house. A communication should be made between each cellar (where there are more than one), by means of an opening over or near the doors and next the ceiling, three feet long and one foot deep. A circulation of air would thereby be effected, and for security parallel iron bars may be placed in the openings. By this means, the cellars may be continually ventilated, so as to expel the damp and noxious vapours, which are usually collected in them; while the draught of the chimney is, in a considerable degree, promoted.

The dangers arising from the sudden, or frequent inhalation of such air as is often generated in close and damp cellars, have already been stated, together with the most proper method of obviating its deleterious effects.

[In London, all the cellars under the streets are arched with brick, and covered a foot deep with pounded clay, after the arches have been previously well *grouted*, and the mortar set.—T. C.]

CEMENT, generally signifies any glutinous matter, capable of uniting and keeping substances in close cohesion. It principally denotes compositions employed for holding together broken glass, &c. For this purpose, the juice of garlic is recommended as exceedingly proper; also a preparation of fresh cheese cut in thin slices, which should be boiled in different waters, and continually stirred: thus it is converted into a very tough and elastic mass, which will not incorporate with liquids. After being sprinkled with a little boiling water, and worked upon a hot stone, a small quantity of unslacked lime should be added, and the whole beat into the consistence of a paste. This composition will prove a strong and durable cement for wood, stone, earthen-ware and glass: when thoroughly dry, it resists every effect of water.

A cement for joining *glass* and *china*, used in Germany, is prepared as follows: Take, by measure, two parts of litharge, one of unslacked lime, and one of flint glass; let each be separately reduced to the finest powder, and worked up into a paste with old drying oil.

[Glass can also be mended to hold cold water, with juice of garlic. And with common white paint, *provided* the oil is made very drying before it is mixed with the white lead, and *provided* the white lead contains no whiting; if *good* paint of this description be used, and the china mended with it, be left untouched for 2 or 3 months in a warm place, it will hold even hot water. Eton's Turkish cement, hereafter mentioned in this article, I have used repeatedly with success.—T. C.]

Cement, in building, is used to denote any kind of mortar, which is stronger than that usually employed. The cement commonly used, is either *cold* or *hot*. The former is the second above described. for cementing china, &c which is sometimes, though seldom, resorted to in the erection of walls.

The *hot* cement. in general use, is made of resin; [two parts by weight; bees wax, from two to three parts; let them be melted, and, while hot, thickened with finely powdered brick-dust, well dried from all moisture.—T. C.] The bricks or stones to be conjoined, are heated, and rubbed together, with cement between them.

Another cement is made thus: Take pure quartz, reduce it to a fine powder, add one third part of unslacked lime and work the whole into a paste with the whites of eggs, just before it is wanted. So effectual is this preparation, that in a few minutes it will acquire the compactness and solidity of stone.

A cement of tolerable firmness, may be obtained, by a mixture of gypsum and fresh quick-lime, burnt, sifted, and mixed, with the addition of water: this compound may prove of considerable service in making troughs for holding water, or lining small canals. [Burr-stones are thus cemented, though lime is not always used.—T. C.]

Coarse cement for fastening handles in pestles, glass feet in electrical [illegible] &c. Resin 2 parts, wax one part, thickened with very dry powdered brick-dust, or earthen-ware, and used hot.

Cement to join china. Powdered cheese, white of egg, and powdered quick-lime, worked up together and used quickly.

Cement to join china by fire. Melt together two parts of borax and one of white siliceous sand. Pour them out, grind them into a fine powder, mix them up with a little glue water, and apply it with a hair pencil to the pieces of china to be joined: expose it to a heat just enough to melt this flux. [Rather thus: take glass of borax, finely powdered and sifted; mix it with any liquid that will enable it to stick to the china; tie the pieces together with wire, and expose them in a muffle to a heat that will fuse the borax.—T. C.]

Willis's cement for broken retorts, even during the distillation of phosphorus. Dissolve 2 oz. of borax in a pint of water, thicken it with sifted slacked lime, smear it on the crack with a spatula.

Cement or lute for distillation Blood, quick-lime, and siliceous sand, or quick-lime, and size, or quick-lime and white of egg. Where you want it to come off easily, put but a small quantity of lime. [Or, dry clay mixed up with molasses. A cement for lining sheet iron furnaces, may be made of good clay, wood ashes, and common salt mixed with horse dung; dried gradually, and the cracks filled up with the same composition.—T. C.]

For the distillation [illegible] spirits. Size [illegible] thickened with plaister of Paris and siliceous sand in equal proportions: or in common cases, cloths smeared with white paint

Cements for Derbyshire Spar and other stones. Melt seven or eight parts of resin and one of bees-wax together, with a small quantity of plaister of Paris (gypsum.) If it is wished to make the cement fill up the place of any chips that may have been lost, increase the quantity of plaister. Knead the mass well, heat the broken pieces until they will melt the cement, and press them together, some of the cement being previously interposed.

Temporary cements. To fix glass plates to be ground for optical purposes, joining metallic plates to be turned in a lathe. Resin 4 oz. bees-wax $\frac{1}{4}$ oz add 4 oz of whitening made previously red hot,

Pitch, resin, and a very small quantity of tallow melted together, and slackened by stirring in dry brick-dust, employed by chasers of gold and silver articles to support and hold their work.

Shell Lac is a very strong cement for holding metals, glass, or precious stones, while cutting, turning, or grinding them. The metal should be warmed.

White of eggs mixed with a little quicklime, makes a pretty good cement for glass and porcelain. [It sets too quick.—T. C.]

Gum Arabic dissolved in water, diluted with spirits. and gum ammoniac added, answers well for glass and porcelain.

Isinglass cement. [Eton's *Turkish cement* Dissolve about half an ounce of isinglass, beaten into shreds, in a pint of proof spirit (brandy or whiskey) in a warm place, loosely corked; not in a *hot* place. In two or three days, pour off, (or strain) the clear liquor: dissolve in common spirit of wine, of gum ammoniac, or of gum galbanum, about the size of a small nutmeg. Add this solution to the solution of isinglass, it will make a milky liquor, which will congeal in the cold into a stiff jelly, and must be used warm. When applied to broken china or glass, the pieces should be previously warm; then lay on the cement with a pencil, press the pieces together, binding them with a string.—T. C.]

Japanese cement or rice glue. This elegant cement is made by mixing rice flour intimately with cold water, and then gently boiling it Papers pasted together by means of this cement, will sooner separate in their own substance, than at the joining, which makes it extremely useful in the preparation of curious paper articles which require layers of paper to be cemented together. It is white, dries transparent, and is much preferable to flour paste. With this composition, made with a comparatively small quantity of water; models, busts, statues, &c. may be formed. When dry, the articles are susceptible of a high polish, and are very durable. The Japanese make quadrille-fish of this substance, which so nearly resemble those made of mother-of-pearl, that purchasers are often imposed upon

A cement that resists moisture. Melt without water common glue, with half its weight of resin, to which add some red ochre. Useful for cementing hones to their frames.

Cement that hardens under water. Mix clay and calces (oxydes) of iron plentifully with oil, the mass will harden under water. Mr. Gad, Stockholm.

[Or, mix terras, ochre, smithy slack, or manganese, with good common mortar.—T. C.]

In ETON's Survey of the Turkish Empire, lately published in London, the following composition is mentioned as being in common use among the Turkish and Armenian jewellers, to join glass or steel, or to fasten to watch cases, &c. a setting of jewelry.

"Dissolve five or six bits of mastic, as large as peas, in as much spirit of wine as will dissolve them: in another vessel dissolve as much isinglass (previously soaked in water till soft and swollen) in French brandy, as will make two ounces of strong glue; add two small bits of gum galbanum or gum ammoniacum, which must be rubbed till they are dissolved. Mix the whole together with a sufficient heat."

The process above described may be simplified by adding the gum ammoniac to the isinglass during its solution in proof spirits, and exposing the mixture to a boiling heat until it is dissolved, when the solution of mastic in alcohol may be added. The gum ammoniac previously dissolved with the isinglass, promotes the union of the mastic with the mucilage This cement has been tried in London, and found to answer well: it stands against moisture [The process I have already given is better —T. C]

A cement that will stand against boiling water, and even bear a considerable pressure of steam. In joining the flanches of iron cylinders and other hydraulic and steam engines, great inconvenience is often experienced from the want of a durable cement.

Boiled linseed oil, litharge, red and white lead, mixed together to a proper consistence, and applied on each side of a piece of flannel, previously shaped to fit the joint, and then interposed between the pieces before they are brought home (as the workmen term it) to their place by the screws or other fastenings employed, make a close joint.

The quantities of the ingredient may be varied without inconvenience, only taking care not to make the mass too thin with the oil. It is difficult in many cases instantly to make a good fitting of large pieces of iron work, which renders it necessary sometimes to join and separate the pieces repeatedly before a proper adjustment is obtained. When this is expected, the white lead ought to predominate in the mixture, as it dries much slower than the red. A workman knowing this fact can be at little loss in exercising his own discretion in regulating the quantities. It is safest to be on the side of the white lead, as the durability of the cement is no way injured thereby, only a longer time is required for it to dry and harden.

When the fittings will not admit easily of so thick a substance as flannel being interposed, linen may be substituted, or even paper or thin pasteboard; the only reason for employing any thing of the kind, being the convenience of handling.

This cement also answers well for joining broken stones however large. Cisterns built of square stones, put together with this cement, will never break or want any repairs. In this case the stones need not be entirely bedded in it, an inch or even less of the edges that are to lie next the water may be so treated: the rest of the joint may be filled with good lime.

Another cement that will stand the action of boiling water and steam. This cement which is preferable to the former for steam-engines, is prepared as follows:

Take 2 ounces of sal ammoniac, 1 ounce of flowers of sulphur, and 16 ounces of cast iron filings or borings Mix all well together by rubbing them in a mortar, and keep the powder dry.

When the cement is wanted for use take one part of the above powder, and twenty parts of clean iron borings, or filings, and blend them intimately by grinding them in a mortar. Wet the compound with water, and when brought to a convenient consistence, apply it to the joint with a wooden or blunt iron spatula.

By a play of affinities which those who are at all acquainted with chemistry, will be at no loss to comprehend, a degree of action and re-action takes place among the ingredients, and between them and the iron surfaces, which at last causes the whole to unite as one mass. In fact, after a time, the mixture and the surfaces of the flanches become a species of pyrites (holding a very large proportion of iron,) all the parts of which cohere strongly together

Another cement of the same kind Take two parts of flowers of sulphur, and one part of sal ammoniac, and mix them together with a little water to a stiff paste.

Take also borings or turnings of iron in the state in which they are commonly found in the works where boring and turning are carried on, viz. mixed with sand, and sift them finely to get rid of the grosser particles. When the

cement is wanted for use, dissolve a portion of the above paste in urine, or in water rendered slightly aciduləous, and to the solution add a quantity of the sifted borings. This mixture, spread upon or between flanches of iron pipes, or put into the interstices of other par of iron work, will in a little time come as hard as a stone.

Blood cement. A cement often used by coppersmiths to lay over the rivets and edges of the sheet of copper in large boilers, to serve as an additional security to the joinings, and to secure cocks, &c. from leaking: is made by mixing pounded quick-lime with oxen's blood. It must be applied fresh made, as it soon gets so hard as to be unfit for use. The small quantity of fine copper or brass dust, is a good addition on galvanic principles.—T. C.]

We believe, if the properties of this cement were duly investigated, it would be found useful for many purposes to which it has never yet been applied. It is extremely cheap, and very durable.

For an account of the mode of making a cement for terraces; and of the use of liquid pitch to render them impenetrable to water, and secure from the attacks by frost, by C Puymarin, see Tilloch's Phil. Mag. vol. 1.

Cement for preserving wood and brick from decay, and for stopping leaks and fissures, by Silas Constant, of New Jersey. The cement is composed of the following materials; viz tar, pulverised coal (charcoal is esteemed the best) and fine well slacked lime; the coal and lime to be well mixed together, about four fifths coal, one fifth lime; the tar to be heated, and, while hot, thickened with the mixture of coal and lime until it becomes so hard that it may be easily spread upon the surface of a board, and not run off when hot. Turpentine or pitch will answer nearly as well as tar, and plaister of Paris will answer instead of lime; to be used in the same manner. The cement must be applied when warm, and is found to be used easiest with a trowel.

The following valuable composition for a cement for water cisterns, was given to the editor by captain Hunn, who had used it with success. He lined the wall with bricks, and left a space of about six inches between the bricks and the surrounding solid earth: this space he filled with mortar made of lime and pounded gravel: (probably covering the face of the pit with the hot mortar would answer.) Equal parts of pounded brick, sand, and sifted stone lime, were well mixed and worked up with hot lime wash. This composition was spread on as *hot as possible* upon the inside of the well.

To prevent the cooling of the cement, only a gallon must be made at a time. A floor of the cement must be laid, and the top arched, leaving room for a pump to be put down.

[A very hard and dry, and also incombustible cement for floors in lieu of boards or bricks, is, tar thickened with pitch, and while hot made into a plaister with common wood ashes, as much as the hot liquid will take up.—T. C.]

A peculiar kind of cement is prepared at Madras, with which most of the buildings erected in that Indian capital, are cemented It consists of sand and lime, with the addition only of a small quantity of water, in which a proportion of coarse sugar has been previously dissolved. The quick-setting of this mortar, and the great hardness it acquires, can, as Dr James Anderson has observed (in his *Recreations in Agriculture*, vol i.), only be attributed to one of these two causes, namely, either the sugar added, or the quality of the lime-stone employed at Madras.

A patent was granted to Dr. Higgins, for his invention of a "Water cement, or stucco for building, repairing, and plastering walls, &c." The component parts of this cement, are drift or quarry sand, cleansed by washing, and carefully strained from clay, salts, and calcareous, gypsous, or other grains less hard and durable than quartz; after which it is dried, either in the sun, or on an iron plate in a furnace, in the manner of a sand heat. (Sand from the Delaware only requires sifting.) To this must be added, fourteen pounds of the newest lime stone that can be procured; and which heats most in slacking, and slacks soonest when duly watered; (which is fresh and closely kept,) dissolves in distilled vinegar with the least effervescence; leaves as little as possible of an insoluble residuum, and contains the smallest quantity of clay, gypsous or martial matter. This must be previously sifted in a brass wire sieve, as finely as possible, and slacked, by being repeatedly immersed in, and quickly drawn out of, a butt filled with soft water, till it be made to pass easily through the sieve; rejecting that part of the lime which is too coarse. The patentee directs to continue that process, till as many ounces

have been passed through the sieve as there are quarts of water in the butt. The impregnated liquor must stand in the vessel, closely covered up, until it becomes clear, when it should be drawn off through wooden cocks, as fast and as low as the lime subsides; being now fit for use. Dr Higgins denominates this solution, the *cementing liquor*. Fifty-six pounds of lime, prepared in the same manner as before, are next to be slacked, by gradually sprinkling on it the cementing liquor, in a close and clean place. The slacked part must be immediately sifted, and the lime, if not used instantly, kept in air-tight vessels; care being taken to reject those pieces which do not pass through the sieve. This richer lime, the Doctor calls *purified lime*. Bone-ash is then prepared, by grinding the whitest burnt bones, which must be sifted much finer than that commonly sold for making cupels. The principal materials being thus prepared, fifty-six pounds of the coarser sand, and forty-two of the fine sand, are to be mixed on a large plank of hard wood, placed horizontally, and spread so that it will stand to the height of six inches, with a flat surface on the plank. This must be wetted with the cementing liquor, and whatever superfluous quantities of it will not incorporate with the sand, must flow off the plank. To the wetted sand are to be gradually added fourteen pounds of the purified lime, tempered in the same manner as fine mortar; with this composition are, by degrees, to be mixed, fourteen pounds of the bone-ash, and the whole beaten quickly together; as the sooner, and more perfectly these materials are tempered together, and the quicker the cement thus formed is used, the better it will answer the purpose. This Dr. Higgins calls the *water cement coarse grained*; it is to be applied in building, pointing, plastering, stuccoing, &c. in a similar manner with mortar; the principal difference being, that as cement is shorter, and dries much sooner than mortar, or common stucco, it ought to be worked expeditiously in all cases; and, in stuccoing, should be laid on by sliding the trowel upwards on it; and that the materials used with this cement in building, ought, when it is laid on, to be well moistened with the cementing liquor; which is also to be employed, if necessary, in wetting the cement, or reducing it to a fluid state. When such cement is required to be of the finer sort, ninety-eight pounds of the fine sand are directed to be wetted with the cementing liquor, and tempered with the purified lime and bone-ash, in the manner already described; with the [illegible] variation, that fifteen pounds of lime are to be used instead of fourteen, if the greatest part of the sand be as fine as Lynn sand. This is called *water cement fine-grained*, and is to be used in giving the last coating to, or finishing, any work intended to imitate the finer grained stones, or stucco: it may, nevertheless, be applied to all the uses of water cement coarse-grained, and in a similar manner. Whenever, for any of the above-mentioned purposes, of pointing, building, &c. a coarser grained and cheaper sand is required, fifty-six pounds of the [illegible] sand, or of fine rubble [illegible], twenty-eight of the coarse [illegible] fourteen pounds of the fine sand, are to be mixed together, and wetted with the cementing liquor, as [illegible] directed; to which fourteen pounds, or somewhat less, of the purified lime [illegible] a similar quantity of the [illegible] to be added; and the whole tempered together in the manner already mentioned. When the cement is required to be white, colourless sand, lime, and the whitest bone-ashes are to be selected. Grey s[illegible] grey bone-ash, formed of half-burnt bones, are to be chosen for making the cement grey. Other colours may be obtained, by employing coloured sand, or by mixing the necessary quantity of coloured talc in powder, vitreous or metallic powders, or other durable ingredients, usually employed in making paint. This water cement, whether coarse, or fine grained, may be used in forming artificial stone, by making alternate layers of cement, and of flint, hard stone, or brick, in the moulds of the intended stone, and by exposing the masses, thus formed, to the open air, in order to harden. When such cement is wanted for water-fences, two thirds of the prescribed quantity of bone-ash are to be omitted, and an equal proportion of powdered tarras to be substituted: and if the sand be not of the coarsest sort, more tarras must be added, which should not exceed in weight one-sixth part of the former. When a cement [illegible] the finest grain, and in a fluid form [illegible] required, so that it may be applied [illegible] a brush, flint powder, pounded [illegible], or other hard, earthy substance, may be used, instead of sand, but in smaller quantity, and in proportion to the fineness of the flint, or other powder, so

that it shall not amount to more than six times, nor less than four times, the weight of the lime. According to the greater or smaller quantity of lime, the cement will be more or less liable to crack, by quick drying. Where the sand above described, cannot be conveniently procured, or, where it cannot be washed and sorted, that which bears the greatest resemblance to the mixture of coarse and fine sand, may be selected; provided due attention be paid to the quantity of lime, which is to be increased, when the sand is fine, and to be diminished, in proportion to its coarseness. In situations where sand cannot be procured, any durable stony body, or baked earth, grossly powdered, and sorted in a similar manner, may be substituted by measure, but not by weight, unless such gross powder be of the same specific gravity. Sand may be cleansed from softer, lighter, and less durable matter, and from the particles which are too fine, by washing.

[Perhaps the following miscellaneous addition of Recipes for Cements and Lutes, will be worth inserting, at the expense of a little repetition —T. C.]

Fire Lute.—For a fire lute, take porcelain clay, i. e. decomposed [illegible] found near Philadelphia, [illegible] it be pounded small, and mixed up to the consistence of thick paint, with a solution of two ounces of borax in a pint of hot water. For want of this peculiar kind of clay, slacked quicklime mixed up in the same manner, may be used. This may be kept ready mixed in a covered vessel.

Cold Lute—Take equal parts, by measure, of the above clay, and wheat flour; mix them to a proper consistence with cold water. This is more tenacious than the fire lute, but does not keep so well. Or, clay and molasses may be used.

Another—A very excellent lute for many purposes, may be made by beating up an egg, both the white and the yolk, with half its weight of quick-lime, in powder. This lute is to be put upon a piece of linen, and applied as usual. It dries slowly, but becomes very compact, and acquires great hardness.

Cement for joining Broken Glass—[illegible] an ounce of hard dry cheese, grate [illegible] small as possible, and put it, with an equal weight of quick-lime, into 3 ounces of skimmed milk; mix them thoroughly, and use the composition immediately. Where the broken vessels are for service only, and the appearance is not to be regarded, the joints may be made equally strong with any other part of the glass, by putting a slip of thin paper or linen, smeared with this cement, over them after they are well joined together by it. This method will make a great saving in the case of glasses employed for chemical, or other similar operations.

A cement of the same nature may be made by tempering quick-lime with the curd of milk till it be of a due consistence for use. The curd, in this case, should be as free as possible from the cream or oil of the milk. On this account it should be made of milk from which the cream has been well skimmed off, or the kind of curd commonly sold in the markets made of whey, and the milk from which butter has been extracted, comonly called buttermilk. This cement should be used in the same manner as the preceding, and they may be applied to stones, marble, &c. with equal advantage as the compound one above given, and is much more easily and cheaply prepared

Good drying oil ground up with white lead, is amongst the best cements for china and earthenware; but where it is not necessary the vessels should endure heat or moisture; isinglass glue, with a little tripoli or chalk is better.

Cement to mend Broken China or Glass.—Garlic stampt in a stone mortar; the juice whereof, when applied to the pieces to be joined together, is the finest and strongest cement for that purpose, and will leave little or no mark if done with care. Or,

Mix very finely powdered and sifted powder of burnt gun flints, with white of eggs, with juice of garlic, or with paint of white lead. Either will do, giving time to dry.

China is mended by burning, thus: Powder of burnt gun flints, one part by weight: powder of glass of borax, 2 parts: mix them together: sift through fine muslin: lay it on the edges of the broken pieces by means of a camel's hair pencil and very weak gum water: expose them in a furnace to a heat sufficient to melt the composition into a glass.

Turkey Cement for joining Metals, Glass, &c.—The jewellers in Turkey, who are mostly Armenians, have a curious method of ornamenting watch cases and similar things, with diamonds and other stones, by simply glueing them on. The stone is set in silver or gold, and the lower part of the metal made flat, or to correspond to the part

to which it is to be fixed; it is then warmed gently, and the glue applied, which is so very strong that the parts never separate. This glue, which may be applied to many purposes, as it will strongly join bits of glass or polished steel, is thus made: Dissolve five or six bits of mastic, as large as peas, in as much spirit of wine as will suffice to render it liquid; in another vessel dissolve as much isinglass (which has been previously soaked in water till it is swollen and soft) in French brandy, or in rum, as will make two ounces, by measure, of strong glue, and add two small bits of gum-galbanum or ammoniacum, which must be rubbed or ground till they are dissolved: then mix the whole with a sufficient heat. Keep it in a vial, stopped; and when it is used set it in hot water.

Good Cement for Wood or Glass.—Beat an ounce of isinglass to shreds; soak it for a night in warm water, which pour away, then add a pint of brandy; dissolve it gradually by means of gentle heat, and then strain the solution through a piece of fine muslin. The glue thus obtained should be kept in a glass closely stopped. When required for use it should be dissolved with moderate heat, when it will appear thin, transparent, and almost limpid. When applied in the manner of common glue, its effects are so powerful as to join together parts of wood stronger than the wood itself is united. This glue dries into a very strong, tough, and transparent substance, not easily damaged by any thing but aqueous moisture, which renders it unfit for any use where it would be much exposed to wet or damp air.

An excellent Cement, or Glue, for Wood or Paper.—Isinglass two parts, gum Arabic one part, dissolved in a small quantity of gin or proof spirit, by a very gentle heat, and preserved in a bottle for use.

Blood Cement for repairing Copper Boilers, &c.—This cement is often used by copper-smiths, to lay over the rivets and edges of the sheets of copper, in large boilers, to serve as an additional security to the joinings, and to secure cocks, &c. from leaking; it is made by mixing pounded quick-lime with ox-blood. It must be applied fresh made, as it soon gets so hard as to be unfit for use. If the properties of this cement were duly investigated, it would be found useful for many purposes, to which it has never yet been applied. It is extremely cheap, and very durable.

A Cement for stopping Cracks in Cast Iron Boilers.—Common salt by measure four parts, smithey slack one part, flowers of sulphur three parts, [illegible] part, water to make the ingredients into a paste.

To make Japanese Cement or Rice Glue.—This excellent cement is made by mixing rice flour intimately with cold water, and then gently boiling it. It is beautifully white, and dries almost transparent. Papers pasted together by means of this cement will sooner separate in their own substance than at the joining, which makes it extremely useful in the preparation of curious paper articles, as tea-trays, ladies' dressing-boxes, and other articles which require layers of paper to be [illegible] together. It is in every [illegible] are preferable to common paste made [illegible] wheat flour, for almost every purpose to which that article is applied; it answers well in particular, for pasting into books the copies of writings taken off by copying machines on [illegible]zed silver paper.

With this composition, made with a comparatively small quantity of water, that it may have the consistence similar to plastic clay, models, busts, statues, basso-relievos, and the like, may be formed [illegible] dry, the articles made of it are susceptible of a high polish; they are also very durable. The Japanese make quadrille fish of this substance; which so nearly resemble those made of mother of pearl, that the officers of our East Indiamen are often imposed upon.

A Cement that resists the action of fire and water.—Take half a pint of milk and mix it with an equal quantity of vinegar, so as to coagulate the milk. Separate the curd from the whey, and mix the latter with the whites of four or five eggs, after beating them well up. The mixture of these two substances being complete, add quick-lime to them which has passed through a sieve, and make the whole into a thick paste of the consistency of putty. If this mixture is carefully applied to broken bodies, or to fissures of any kind, and dried properly, it resists water and fire.

Preparation of common Cement for join-ing Alabaster, Marble, Porphyry, or other Stones.—Take of bees-wax two pounds, and of resin one pound, melt them, and add one pound and a half of the same kind of matter, powdered, as the body to be cemented is composed of, strewing it into the melted mixture, and

stirring them well together. The proportion of the powdered matter may be varied, where required, in order to bring the cement nearer to the colour of the body on which it is employed: as limestone for marble: brick-dust sifted, &c. &c.

This cement must be heated when applied; as also the parts of the subject to be cemented together; and care must be taken likewise, that they are thoroughly dry.

To restore Cast Iron Furnaces, and Soap Pans, that, through accident or mismanagement, may be cracked.—Take new lime, slacked, and finely sifted, mix it up with white of eggs, well beaten, till it is of [illegible] consistence of pap, or soft [illegible] se[illegible] add to it some iron file dust, [illegible] this composition fill up the ins[illegible] the crack (which will be sufficient) raising a little seam or bead upon it, and it will soon become hard and fit for use.

Cement for [illegible] Flues.—Common salt, and sifted [illegible] ashes, equal parts, made into a paste with water, and a little molasses, make a good cement for iron flues, &c. better than most other compositions, and may be applied when the flue is hot or cold. Iron filings, vinegar, salt, and flour, make [illegible] very hard composition.

Cements for Cisterns to hold Water, used at Paris.—Boiled oil, calcined bones, and smithy slack, or any rust of iron, or levigated iron ore.

At Vienna.—Tallow, one part, resin, two parts, finely powdered stone coal, four parts

Another.—*Well burnt and fresh burnt* [illegible] one part; sharp sand, four parts; smithy slack, two parts; mixing some molasses with the water, makes a good mortar; and is a substitute for terras; whose properties are due to the iron it contains calcined by volcanic action.

Or, take three parts flour of sulphur, one part smithy slack, and two parts of fresh lime.

In all these compositions, molasses is a very useful ingredient, where the expense is not an object. Indeed, a mixture of molasses and good clay earth, well beaten together and used, becomes in a day or two a hard cement, impervious to water. A little smithy slack improv[illegible].—T. C.]

* Those of our readers, who may be desirous of additional information, relative to this interesting subject, we refer to the translation of M. Loriot's "*Practical Essay on Cement and Artificial Stone*,"* 8vo. 1774; and to Dr. Higgin's "*Experiments and Observations, made with a view of Improving the Art of composing and applying Calcareous Cements, and of preparing Quicklime, &c* 8vo. 1780; in which the matter is fully and ingeniously discussed. See Lime, Lute, and Mortar.

CEMENTATION, in the arts, a general method of forming steel from iron, by means of the application of charcoal. In a proper furnace layers of bars of malleable iron and layers of charcoal are placed one upon another, the air excluded, the fire is raised to a great height, and kept up for eight or ten days. If after this the conversion of the iron into steel be complete, the fire is extinguished, and the whole is left to cool for six or eight days longer. Iron prepared in this manner is named blistered steel, from the blisters which appear on its surface. Copper is converted into brass by cementation with the powder of calamine and charcoal.

CENTRE, of *gravity*, that point about which all the parts of a body do, in any situation, exactly balance each other: hence if a body be suspended by the centre of gravity it will remain at rest in any position:—When the centre of gravity is supported, the whole body is kept from falling; and when this point is at liberty to descend, the whole body must descend, either by sliding, rolling, or tumbling down See Mechanics.

CENTRAL *forces*, the powers which cause a moving body to tend *towards*, or *recede* from, a centre of motion The *former* is called the centripetal force, the *latter* the centrifugal force. If a stone at the end of a string be whirled round by the hand, the centripetal force is represented by the hand, and the centrifugal force by the endeavour which the stone makes to fly off in a right line.

CEPHALIC, generally signifies whatever relates to the head. Hence those remedies that are given for disorders of that part, are denominated *cephalic medicines* Under this description are comprehended cordials, and whatever tends to promote a free circulation of

[Loriot's patent was merely for mixing well burnt and recently burn t lime, ground and powdered with common mortar: it was merely improving stale mortar; an account of it is given in an early number of the Annual Register. Johnson's patent stucco was lime, sand, and blood.—T. C.]

the blood through the brain. Thus cephalic snuff is taken with a view to remove pains in the head, by occasioning the patient to sneeze, and in this manner, perhaps, giving vent to obstructions in the smaller vessels. Such is the imperfect theory of cephalic medicines; and, strictly speaking, we are possessed of no *specific* remedy for relieving a common head-ach, unless the cause from which it proceeds can be ascertained. Of the multiplicity of circumstances which may operate to produce that complaint, and likewise of the most proper means of alleviating it, we shall endeavour to convince the reader, under the article HEADACH.

[All cephalic snuffs, are much worse than harmless: the cause of head-ache in nine cases at least out of ten, is indigestion, and acidity in the stomach; and the remedy is magnesia.—T. C.]

CERUSSA. See WHITE LEAD.

CERVUS, the deer, abounds in cold countries, but the cervus tarandus, or rein-deer, is the most valuable of all the species, as to the Laplander it is a complete substitute for the horse, the cow, the sheep and the goat: it will travel, with a sledge at his back, and a person sitting in it, more than 100 miles a-day: is extremely docile, and will live upon little. Its favourite food is the Lichen Islandicus, or Lapland moss, which it digs out from under the snow with its horns.

CETE, an order of animals in the Linnæan system, including the Monodon, the Balæna, Physeter, and Delphinus. Though ranked among the Mammalia, they live in water like fish, but in their structure they are more nearly allied to quadrupeds than fishes.

CHADLOCK. See CHARLOCK.

CHAFER, COCK-CHAFER, May-beetle, or, Jeffry Cock, *Scarabæus Melolontha*, L. is an insect belonging to a genus, which comprises eighty-seven species. It has, like all the rest, a pair of cases to its wings, of a reddish brown colour, sprinkled with a whitish dust, which is easily separated. The necks of these insects are, in some years, covered with a red plate; in others, with a black; but they are distinct varieties. Their fore-legs are very short, and thus better calculated for burrowing in the ground, to which they instinctively retreat.

Chafers are well known by the buzzing noise they make, in the evening, when rising in the air; but particularly for the irreparable mischief they occasion to the industrious cultivator; having been found, in some seasons, so numerous, as to consume every vegetable production. These pernicious vermin are generated from eggs, which the females usually deposit, about six inches deep in the ground. Three months after, the inclosed insects begin to break the shells, and crawl forth, in the form of small grubs, or maggots, which feed upon the roots of whatever vegetables they meet with. In this worm state, they continue for more than three or four years, devouring the roots of every plant they approach, and burrowing under the ground with the utmost celerity for food. At length, they exceed a walnut in size, being large, white, thick maggots, with red heads, which are most frequently found in newly-turned earth, and are much sought after by every species of birds. When largest, they are an inch and a half long, of a whitish yellow colour, with bodies composed of twelve segments, or joints, on each side of which there are nine breathing holes, and three red feet. The head is larger in proportion to the body, of a reddish colour; with a forceps or pincer before, and a semicircular lip, with which they cut the roots of plants, and suck out their moisture. They have no eyes, but are furnished with two feelers, which serve to direct their motions under ground.

At the expiration of four years, these destructive insects prepare to emerge from their subterraneous abode. About the latter end of autumn, the grubs begin to perceive their transformation approaching; when they bury themselves deeper in the earth, sometimes even six feet below the surface, where they form capacious apartments, the walls of which become very smooth and shining, by the excretions of their bodies. Soon after, they begin to shorten themselves, to swell, and burst their last skin, preparatory to their change into a *chrysalis* This appears at first to be of a yellowish colour, which gradually heightens, till at length it becomes almost red. Its external figure clearly displays the characters of the future winged insect, all the fore-parts being distinctly seen; while behind, the animal seems as if wrapped in swaddling clothes.

In this state, the young cock-chafer, or May-bug, continues for about three months longer; when, towards the beginning of January, the *aurelia* divests itself of all its impediments, and becomes a complete winged insect. But

it has not attained its natural health, strength, and appetite: unlike all other insects, which arrive at their state of perfection as soon as they become flies, the cock-chafer continues feeble and sickly. Its colour is much brighter than in the perfect animal; all its parts are soft, and its voracious nature appears suspended. In this state, it is frequently found, and is erroneously supposed by those who are ignorant of natural history, to be an old one, of the former season, which has buried itself during the winter, in order to revisit the sun the ensuing summer. The fact is, the old one never survives the season, but perishes in the same manner as every other species of insects, from the severity of the cold, during winter.

Towards the latter end of May, these insects burst from the earth, the first mild evening that invites them abroad; after having lived from four to five years under ground. They are then seen to emerge from their close confinement, no longer to live on roots, and imbibe only the moisture of the earth, but to choose the sweetest vegetables for their food, and to sip the evening dew. An attentive observer will, at that time of the year, see every path-way strewed with them, and, in warm evenings of May, myriads of them are buzzing along, flapping against every thing that impedes their flight. The heat of the mid-day sun, however, seems to be too powerful for their constitution; they, therefore, conceal themselves in clusters, under the foliage of shady trees, but particularly of the willow, which appears to be their most favourite food, and which they seldom quit, till they have consumed all its verdure. In seasons favourable to their propagation, they are seen in an evening, in considerable swarms; their duration, however, is but short, as they never survive the summer. They begin to pair, soon after they have emerged from their subterraneous prison; and the female then carefully bores a hole in the ground, with an instrument for that purpose, with which she is furnished at her tail, and deposits her eggs there, generally to the number of sixty.

Destructive as these insects, in their worm state, are to vegetation, they would be still more so, were they not destroyed by birds, and more especially *rooks*, which devour them in great numbers. Half a century ago, they were so exceedingly numerous in the county of Norfolk, England, that they destroyed not only the verdure of the fields, but even the roots of vegetables. One farmer, in particular, was so much injured by them, in the year 1751, that he was unable to pay his rent. Many crops in that county were then almost ruined by the devastations these insects committed, in their worm state; and, when they took wing next season, trees and hedges were in many parishes, completely stripped of their leaves. At first, the people brushed them down with poles, swept them up, and burnt them. JAMES EBDEN, a Norfolk farmer, made oath, that he gathered *eighty bushels;* but their number did not seem much diminished, except in his fields. Neither the severest frosts in our climate, nor even water, will kill them; as, on being exposed to the sun and air, for a few hours, they will recover, and resume their former lively state. One of the best methods to be adopted for preventing their transformation, is, to plough up the land in thin furrows, to employ children to pack them up in baskets, and then to strew salt and quick-lime on the ground, and harrow it in.

We have but an imperfect knowledge of the nature and history of the insect, called by the French *Vinaigrier*, and of other *scarabivorous* animals, to avail ourselves of their labours. This, however, is clear, that if such insects as devour grubs, should take possession of the soil where cock-chafers abound, they must, in a short time destroy immense numbers of the latter; and as they have five successive seasons to prey on them, till they attain their perfect state, they may be entirely extirpated, before one fly can be produced.

It is a circumstance well known, that the whole of the *corvus*, or crow, and pie-tribes, are exceedingly fond of chafers, and particularly at a season when grain is scarce (*i. e.* from the end of seed-time to the beginning of harvest); they search for them with the utmost avidity. These sagacious birds, having observed that the leaves of such plants as are attacked by the grub, appear withered or drooping during the day, they fly to them, dig for it with their strong bills, to the very root; and, if they do not find it, pull the plant itself out of the ground. It also frequently happens, that they mistake the drooping leaves of plants newly set, for those injured by grubs, and seize upon these; thus finding no prey,

they strike their bills into the ground, at their roots, pull them up one after another, and, if not watched, do great mischief. Strawberries are particularly liable to the depredations of the grub; hence, sometimes, whole fields of strawberry-plants are spoiled by the rooks, immediately after they have been set. To prevent such devastation, it is necessary to guard them till their leaves assume an upright position.

This damage, however, is but trivial, when compared with the real benefit occasioned by the rooks picking these vermin out of both grass and corn-land. Great care ought, therefore, to be taken not to disturb these birds, especially as in fallowed lands, where grubs generally abound, they are of infinite service. In this case, the land should be stirred with the plough as often as the weather will permit; for, if the rooks once find their way thither, they will not abandon the plough, unless driven away by violence, and each time the land is stirred, they will destroy multitudes of these vermin. Were this the only advantage to be derived from their destruction, it would amply compensate the farmer for the labour and expense bestowed upon it. Independently of the beneficial effect which this management produces on the fertility of the fallow-land, it may frequently be attended with the destruction of a whole race of grubs, in the adjacent fields.

But, as this method is impracticable in gardens, recourse ought to be had to other expedients. Gardeners have observed that cabbages, cauliflowers, strawberries, and especially lettuces, are the favourite food of the grub. In order to destroy that pernicious insect, they plant a row of lettuces between the rows of strawberries, in which case the insect will preferably attack the former. Hence, they carefully examine the plants every day, walking along the rows with a trowel: wherever they observe leaves falling, they know their enemy is on the spot; immediately dig it up, and thus destroy the grub.

The whole race of these insects may probably be extirpated in stiff soils by long continued rains, during the winter. For at that time, they having descended deep into the ground, the passage must be in some measure left open, so as to allow the water, if in abundance, to soak down to the bottom of their hole; which, in a retentive soil, it will fill, and, if continued a sufficient time, infallibly drown them. Wherever irrigation is employed for other purposes, the extermination of the grub may be effected by this method; and there are many situations, in which water may be commanded in quantities adequate to this important purpose. It is highly probable, that if a stream of water could be spread over the surface of the grass-field, only for a few days, during any of the winter or spring months, all the grubs might be drowned in their holes: and as water is most abundant in that season, a very small stream might be so conducted, in different directions, as to inundate a large tract of ground. The benefit of one irrigation, thus managed, would be felt for five years. We therefore venture, with Dr. ANDERSON, to recommend this mode of destroying grubs, to those who have grass-lands infested with them; especially when they are intended to be converted into corn-land; for the injury done by grubs to the first crop, is often severely felt. It might even be safely applied to orchards and wood-lands, provided that the water were not continued longer than is necessary to effect the destruction of the worms.

CHAFF, in husbandry, the husks of the corn separated from the grain, by screening or winnowing it. This term is also applied to the rind of corn which in grinding it, produces the coarser part of the meal.

CHAFF-CUTTER. See STRAW-CUTTER.

CHAIN. See MENSURATION.

CHALCEDONY, a genus of the semipellucid gems, variegated with different colours, disposed in the form of mists or clouds, owing to an admixture of colours imperfectly blended in the general mass, and often visible in distinct molecules.

CHALDRON, is a dry English measure, generally used for sea-coal, and consisting of 36 bushels, filled up according to the sealed bushel kept at Guildhall, London. On ship-board, 21 chaldrons are allowed to the score; each of which should weigh 2000 pounds: hence a bushel of coals ought to weigh from 56 to 62 lbs. See BUSHEL.

CHALK, *Creta*, is a white earth, abounding in Britain, France, Norway, and other parts of Europe, which, is said to have been anciently dug chiefly in the island of Crete, whence it has received its name.

This substance is found most plentifully in the county of Kent, in England,

on the sides of hills, which the workmen undermine to a certain depth: they then dig a trench at the top, as far distant from the edge as the mining extends at the bottom: then fill the trench with water, which soaks through during the night, when the whole mass falls down. In other parts of the kingdom, it generally lies much deeper in the ground.

[It has not yet been found in America. It seems to be a newer and later deposit than any of our strata. When finely pounded, sifted, washed and freed from all gritty particles, it forms *Whiting*, and when these processes are carefully repeated, *Spanish White.*—T. C.]

Chalk easily imbibes water: hence masses of it are employed for drying precipitates, lakes, earthy powders that have been levigated with water, and other moist preparations. Its domestic uses for cleaning and polishing metallic or glass utensils, are well known. It is also of considerable service on ship-board; when mixed in the proportion of half an ounce to a gallon of distilled sea-water, which may be thus sweetened, and kept perfectly fresh.

In medicine, chalk* is reputed to be one of the most useful absorbents, and in this light only, deserves notice. Several years ago, a person at Edinburgh pretended to have discovered a specific for curing every kind of those *erythematous* or inflammatory eruptions, which often attend the chronic erysipelas, or the rose, on the legs, merely by applying powdered chalk to the parts affected: and though we have had no experience of this remedy, it does not appear to us, as proper and safe as *hot flour*, the good effects of which, on such occasions, we have frequently witnessed.

[The chalk is a good application; so is magnesia; for the exudation is frequently acid.—T. C.]

Black Chalk, or *Drawing Slate*, is an earthy substance of slaty texture, generally of a greyish, sometimes a blueish black colour.

It is soft and smooth to the touch, and in handling stains the fingers.

To crayon painters, and other artists, black chalk is a very useful article. Considerable quantities of it are imported from France, Spain, and Italy. The best comes from Italy. This is more free from gritty particles, more firm and compact in its texture, and in its touch much smoother than the chalk either of France, or Spain. It contains somewhat more than one tenth part of its weight of charcoal. When strongly heated it loses its colour, and becomes reddish grey

Red Chalk, *Red Ochre*, or *Reddle*, is an iron ore of blood-red colour, which is sometimes found in powder, and sometimes in a hardened state. It has an earthy texture, and stains the fingers when handled.

The principal use of red chalk is for drawing; the coarser kinds are employed by carpenters and other mechanics, and the finer kinds by painters. For the latter purpose it should be free from grit, and not too hard. In order to free it from imperfections and render it better for use, it is sometimes pounded, washed, mixed with gum, and cast into moulds of convenient shape and size.

Under the name of reddle this substance is much used for the marking of sheep; and, when mixed with oil, for the painting of pales, gates, and the wood-work of out-buildings.

CHALYBEATE, in medicine, is an appellation given to any liquid, as wine or water, impregnated with particles of iron or steel.

Chalybeate medicines operate like other preparations of iron, as tonics, and as astringents, the only difference being in degree. They are likewise supposed to differ according to the na of the acid united with the metal: thus vegetable acids impart to them a detergent and aperient virtue. When combined with the vitriolic acid, they operate on the first passages as powerful aperients; the nitrous acid renders them very styptic, and the muriatic produces the same effect in the highest degree. [Tinctura-martis is one of the best preparations.—T. C.]

The use of chalybeates has occasionally been attended with great success, when united with cathartics, especially in cases of *chlorosis*, pains of the stomach, and palpitations of the heart; but we think females, in particular, ought never to take them, without proper advice.

CHAMBER, in building, a part of a lodging, or a partition of an apartment, usually intended for the accommodation of beds. We have already given a few directions for correcting a vitiated atmosphere, particularly that of *bed chambers*, (see AIR, and BED-ROOM); so that we may conclude this article with a short account of a curious mode of *cooling* the air in rooms, frequently practised by the Germans.

* [When powdered and washed in the form of whiting.—T. C.]

In the hot days of summer, especially in houses exposed to the meridian sun, a capacious vessel filled with cold water is placed in the middle of a room; and a few green branches (or as many as it will hold,) of a vigorous lime, birch, or willow tree, are plunged with their lower ends into the fluid. By this easy expedient, the apartment will, in a short time be rendered much cooler; as the evaporation of water produces this desirable effect in sultry weather, without any detriment to health. Besides, there can be no doubt, that the exhalation of green plants, under the influence of the solar rays, greatly tends to *purify* the air; and consequently deserves every attention of persons liable to pulmonary, or other complaints, in which the organs of respiration are affected.

[If when merely moist, not wet, the branches be swung backward and forward, the cooling effect will be greatly increased. In the East Indies, they use a piece of moistened muslin, suspended from the ceiling by pullies and worked backward and forward.—T. C.]

CHAMOMILE, *Anthemis*, L. a genus of plants comprising 21 species.

Both the leaves and flowers of chamomile, are used in fomentations and poultices. From their antispasmodic powers, they are frequently found to relieve pain, especially in complaints of the kidneys, and in child-bed.

CHAMPIGNONS. *Agaricus orcades*, a species of mushroom found on hedge-banks, in pastures, and in what are called fairy-rings, with brownish or watery white gills, two or four in a set, a pale brown, convex, and irregular cover, and a whitish stem. They have a much higher flavour than the common mushroom; but from their leathery nature are indigestible, except in the form of powder, with sauces, or in catsup, in all which they are very admirable.

CHANCERY, the Court of the Lord-Chancellor; the highest seat of justice, in Great-Britain, save the parliament itself. This Court is at once the strength of the law, and the bulwark of individuals against its unavoidable imperfections. As a court of common law, it can enforce proceedings in the lower Courts; and, as a Court of Equity, give relief where nothing can be done before a jury, and soften the rigour of law where it falls hardly and unjustly upon individuals. In this court, the law is viewed as always intending to do right; and the *spirit* is consulted, where the *letter* would produce an improper consequence. No plaintiff, however, is to come to this Court in any case where remedy may be had at law; and that which can be tried by a jury is not triable in this Court.

CHANGES, in Arithmetic, the variations or permutations of any number of things with regard to their order, position, &c. The number of changes is found by a continual multiplication of all the terms in a series of arithmetical progressionals, whose first term, and common difference is *unity*. Thus if we are seven in family, and it is required to find in how many different ways we may sit at table, the answer is $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 = 5040$.

If there were 8 persons, then the answer would be $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 = 40320$.

CHANNEL, the deepest part of a river, strait, &c. also an arm of the sea running between an island and the main or continent, as the British Channel, Irish Channel, &c. [Hence by corruption, *kennel*, a gutter in a street.—T. C.]

CHAPS, are flaws or cracks which appear on the skin, and are induced by various circumstances.

Chaps in the face generally proceed from the action of external cold; which, by impeding the perspiration of this part, or contracting the fibres unequally, causes them to be drawn asunder; so that a fissure succeeds, which produces very uneasy sensations; and is often attended with acute pain. In order to prevent or remove such chaps, the face ought never to be *suddenly* exposed to the cold air, after leaving the fire-side, or a warm room: nor should such part be washed with common soap. Previously to retiring to bed, it may be anointed with *unscented* pomatum, which should not be removed till the following morning; or honey-water may be preferably applied, and suffered to dry; care being taken to cleanse the part from dust and other impurities.

Chaps in the lips, frequently arise from the same cause as those of the face; though the former sometimes occur in scrophulous habits, or are occasioned by acrid humours settling on the part affected; in consequence of which the lips are apt to swell on each side of the wounded spot. When the complaint is attributed to cold, the treatment above stated will generally effect a cure: in scrofulous cases, a course of medicine, adapted to the na

ture of that disease, can alone remove the external affection. But, where acrid humours are the immediate cause, it will be proper to procure medical advice. The following salve may, in the opinion of Dr. SHAW, be advantageously applied to the lips, in either of the cases above specified: Let 2 scruples of alkanet, and 1½ oz. of oil of sweet almonds, be simmered together over a gentle fire; then strain the liquor; add 3 drachms of white wax, 1 drachm of spermaceti; when the whole should be formed into an ointment.

[This is the common lip-salve, which is greatly improved by a drop of oil of roses, or a few drops of oil of mace.—T. C.]

Lastly, if *chaps in the hands* originate from SCROPHULA, the treatment suggested for similar affections of the LIPS, may be advantageously adopted; or the hands may be anointed with the fat of geese. Should, however, such fissures extend to a considerable depth, and be very difficult to heal, it will be proper to apply digestive ointment, and to treat them as simple wounds. [Wear gloves.—T. C.]

CHARCOAL, or *Carbon* of the chemists, a sort of artificial coal, or fuel, consisting of half-burnt wood. It is chiefly used, where a clear and strong fire without smoke is required; for the humidity of the wood is dissipated by the fire in which it was prepared.

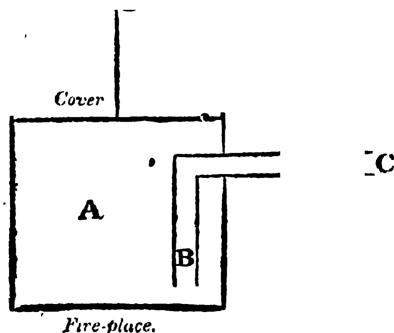
The art of making charcoal is very ancient; for even SOLOMON (Proverbs, xxvi. 21), distinguishes that kind of fuel from common fire-wood. Among the Romans, it was held in great estimation, and ÆMILIUS SCAURUS, the conqueror of the Ligurians, was a charcoal-merchant. PLINY describes the piles of wood erected by the manufacturers of this article, and observes that the blocks ought to be placed in a pyramidal form, coated with clay, and a hole left on the top for conducting the smoke, when the wood is set on fire. Thus, it would be unnecessary to describe the process, for those who employ themselves in the preparation of this article.

Method of making Charcoal—Charcoal both of coal and of wood, is usually made by piling up the wood or coal in a conical heap, covering it with about 4 or 6 inches of dirt or turf, and opening some fire holes to set it on fire. There must be vents at the top to let out the smoke. So soon as all the mass is fairly on fire, stop up the vent holes, and then the heat will be sufficient to drive off the acid vapour and the gas (or carburetted hydrogen) through the covering of mould or turf. When no more vapour escapes, stop every hole carefully so that there shall be no circulation of air whatever within side, and let the mass cool. It usually takes about ten days.

In England both wood and coal, are charred in coak-ovens: But, upon the same principle, only the registers that stop the circulation of air, are more accurate and more manageable. For gunpowder-makers, the wood of maple, willow, or poplar, is distilled in iron cylinders, and the acid liquor called pyroligneous acid is preserved, while the gas is permitted to escape. But even in this way, where the fire surrounds the outside of the cylinder, the middle part of the wood is imperfectly charred.

Here, in the United States, a method has been patented for charring wood, upon a much better principle. Thus,

Pully.



Fire-place.

A, is a sheet iron square case that will hold from ¼ to ½ a cord of wood, in small billets. B, is a sheet iron tube, that reaches within four inches of the bottom of the case. A small fire is made under the bottom: the vapour begins to arise, and with the combustible carburetted hydrogen gas escapes into the air at C. But so soon as this appears, another tube can be affixed to the end C, and the gas in a state of inflammation conducted into the fire-place; no more fuel is now necessary there: the gas itself that arises from the distillation of the wood, furnishes heat more than sufficient.

During the distillation, the whole mass of wood is enveloped in the same vapour, and is therefore never exposed to a heat beyond that of the steam that escapes at C. This heat is uniform, and therefore the wood is uniformly charred. When the pipe, at about 18 inches from the end C, no longer burns the finger on touching it, all the vapour is driven off, and the wood is charred. Extinguish the fire, and let all cool.

I doubt if this process will answer for iron works, which seem to be on too large a scale. But in a few years, the iron masters must use coak of coal, or they must give up their works. The sheet iron case is set on a brick platform, or on walls even with the ground: the fire-place is below the surface of the ground; the chimney at a little distance. The iron case is lifted up and swung round by means of chains and pullies in a fixed wooden frame. The cover should be made tight with ashes, that no steam may escape but up the steam pipe within side. No sand should be used even near the case, for fear of accident by sparks of fire. A Mr. Kurtz is the patentee, but where he now resides, I know not: but I know this is a very great improvement.—T. C.]

Properties. A surprising number of pores have, by the microscope, been discovered in charcoal. Dr. Hoek counted, in the 18th part of an inch, 150, so that in a piece of an inch in diameter, there will be upwards of five millions.

Charcoal may be preserved to an indefinite length of time, and in the ancient tombs of northern nations, entire pieces are frequently discovered. It is, therefore, deserving the attention of those, who wish to preserve valuable records from the "destructive tooth of time," for there yet exists, according to Dodart, charcoal made of corn (probably in the days of Cæsar), which is in so complete a state, that the wheat may be distinguished from the rye.*

This substance is not soluble in any of the acids, but may be dissolved in considerable quantities, by plunging it in a solution of the liver of sulphur, to which it imparts a green colour. Melted with colourless frits, or glass, it gives a pale, dark yellow, reddish, brownish, or blackish colour. Fresh charcoal made of wood strongly attracts air and moisture to the amount of 13 per cent.

Uses. [From the indestructible property of charcoal, arises the use of lamp black in writing ink for records: and the use of charring the ends of posts meant to be put in the ground for post and rail fence They should be charred at least one foot above the part sunk in the ground.

From its non-conducting power, arises its use, in keeping out heat and cold. Hence, in hot-houses now, the walls are hollow and filled with pounded charcoal: and ice may be preserved in wine-coolers and cupboards where the sides and doors are filled up with charcoal. Indeed, I have often thought of making an ice-house above ground, thus. Make a strong wooden box 4 feet square, and as much deep. Make another such box, 42 inches square and as much deep: insert the smaller in the larger, and fill up the interstice with pounded charcoal Paint if you please the outside. When filled with pounded charcoal, connect the 2 boxes at top by a slip of wood all round, of 6 inches broad or more, according to the thickness of your boards, which should be at least 1½ inch thick. Adapt a tight cover; double; filled with charcoal powder. In a hard frost pour into the bottom as much water as will freeze: and do so till you get your case filled with solid ice. Then fit on your cover. Keep it covered with an old blanket: and in summer use your ice.

All sorts of glass vessels, and other utensils, may be purified from long retained smells of every kind, in the easiest and most perfect manner, by rinsing them out well with charcoal powder, after the grosser impurities have been scoured off with sand and potash. Rubbing the teeth and washing out the mouth with fine charcoal powder, will

* [It is so at Herculaneum.—T. C.]

render the teeth beautifully white, and the breath perfectly sweet; where an offensive breath has been owing to a scorbutic disposition of gums. Putrid water is immediately deprived of its offensive smell by charcoal: and fresh meat may be kept 12 months, good, in charcoal dust in a tin case soldered.

By sprinkling it upon old ulcers, the fetid smell is taken off. And charcoal powder mixed with water, is employed with good effect, as a wash for the mouth, to prevent a stinking breath, probably often owing to a rotten tooth.

Charcoal powdered very fine and used with weak vinegar, is the best application to clean the teeth. The vinegar may be diluted with rose-water. —T. C.]

Besides the great advantage which charcoal affords to the artist and manufacturer, it has lately been employed with considerable success, 1. In correcting the burnt or empyreumatic taste of ardent spirits; 2. In depriving rancid oil of its disagreeable flavour, and vinegar of its colour. 3. In restoring putrid meat. For these useful purposes, however, it is fit only when fresh made.

The crews of the two Russian ships, which lately sailed round the world, were extremely healthy. During the whole three years of their voyage, only two men died of the crew of the Neva, and the Naveshda did not lose a single man. It is already known that their fresh water was preserved in charred casks, but it is not so generally known that they used the same precaution for preserving their salted provisions. The beef they carried out with them tasted as pleasantly upon their return, as it did three years before, when first salted.

When employed in the two first-mentioned cases, it should be previously reduced to powder, a very large quantity of which is required for the rectification of distilled liquor; but a smaller proportion, for purifying animal or vegetable oil, so that even the common train-oil may be rendered fit for being burnt in chamber-lamps (? T. C.]

Professor LOWITZ, of St. Petersburgh, (in 1786,) found, that charcoal rendered the crystals of tartar very white and pure, when employed in preparing them; that the marine and nitrous acids are decomposed by being distilled upon it; that the red juices of vegetable fruits are deprived of their colour, without losing part of their acidity; that brown, rancid oils are rendered sweet and clear by agitating them for some days with charcoal in powder; that it changes the smell of putrid vegetables to that of a pure volatile alkali, and produces the same effect on fresh meat. By boiling coals in powder, with honey, the pure saccharine parts of the latter are said to be separated, and the honey to become a well-tasted sugar. Vinegar concentrated by freezing, and distilled from a large portion of powdered coal, is pure, and fragrant. Even the tainted flavour of ardent spirits, when impregnated with any vegetable oils, may in a similar manner be destroyed by being distilled over fresh made charcoal.

Charcoal is of great utility in purifying water on ship-board. Offensive water may be rendered sweet by filtering it through good charcoal and sand. Casks charred on the inside will preserve water a long time sweet; but it would seem to be a preferable mode (where practicable,) to permit the water to undergo the usual fermentation, and then draw it off into the charred casks. See also FENCE, CUCUMBER, MELON.

There are considerable differences in the coals of various vegetables, with respect to their habitude to fire: the very light coals of linen, cotton, some fungi, &c quickly catch fire from a spark, and soon consume: the more dense ones of woods, and roots, are set on fire with greater difficulty, and burn more slowly; the coals of the black berry-bearing alder, of the hazel, willow, lime tree, and maple, are the most proper for making gunpowder, and other pyrotechnical compositions. For the reduction of metallic calces, those of heavier wood, as oak and beech, are preferable; because these appear to contain a larger proportion of the inflammable principle, and perhaps in a more fixed state. Considered as common fuel, those of the heavy woods afford the greatest heat, and require a most abundant supply of air, in order to keep them burning; on the contrary, the coals of the light woods retain a glowing heat, till they are consumed, without a strong draught of air; the bark usually crackles while burning, which is seldom the case with the coal of the wood itself.

Charcoal is likewise of considerable service to different artists, for polishing brass and copper plates, after they have been rubbed clean with powdered pumice stone. Horn plates may be polished in a similar manner, and a gloss after

wards given them with tripoli. Coals of different substances are also used as pigments; hence the bone and ivory-black of the shops. Most paints of this kind are not only incorruptible, but also possess the advantage of full colour, and work freely in all the forms, where powdery pigments are employed; but they ought to be carefully prepared, by thoroughly burning the substance in a close vessel, and afterwards reducing the coal to a fine powder. In drawing outlines, the artist avails himself of pieces of charcoal, the marks of which may be easily rubbed out. For this purpose, the smaller branches of a tree, such as the willow and vine, are usually preferred; and which, after being freed from the bark and pith, afford the best drawing pencils Dr. LEWIS remarks, that the shells and stones of fruit yielded coals, so hard* that they would with difficulty mark on paper, while those of the kernels of fruit were very soft and mellow. All these experiments must be conducted in proper vessels, closely covered (the barrels of old guns, or pistols, may occasionally serve as substitutes.) The doctor levigated various coals into fine powder, mixed them with gum-water and oil, and applied them as paints, diluted with different degrees of white. When laid on thick, they all appeared of a strong, full black; nor could it be discerned, that one was of a finer colour than another; but those diluted with white, or spread thin, had a blueish cast. Horns, and the bones, both of fish and land animals, produced coals more glossy, and of a deeper colour, than vegetables; and which in general were so hard that paper could scarcely be stained with them. but silk, wool, leather, blood, and the fleshy parts of animals, yielded soft coals. Some of these remarkably differed from others, in colour; that of ivory being superior to all, and doubtless the finest of black produced by fire.

In agriculture, charcoal has, in many parts of France and the Netherlands, been substituted for turf ashes, as a manure.

The utility of charcoal (oxyde of carbon,) as a manure, has often been mentioned by practical writers, but was not much regarded until Mr. KIRWAN called the attention of chemists to the subject. Mr. DEANE says, that he had long observed the great fertility of lands near to where coal kilns were burnt, and quotes the *Complete Farmer* for a confirmation of the facts. Carbon is now known to be one of the most universal materials of nature. The whole atmosphere contains always a quantity of it in the form of carbonic acid. It also exists in *lime stone* in the same form, and in the black earth left by the decomposition of vegetable and animal bodies. Morasses too, consist principally of the carbonic recrements of vegetable matter.

By what means this solid substance is rendered fluid, so as to be capable of entering the fine mouths of vegetable absorbents, is not yet decided by chemists The present opinions on the subject, will be noticed under the article MANURES. It is, however, sufficient for the practical man to be assured of the fact, that he will derive much benefit from strewing charcoal on his land. [There is no proof of this; but ARTHUR YOUNG has discovered that charcoal may be dissolved in alkaline liquids, and then furnish the strongest and most efficacious of manures; but in what way this can be procured sufficiently cheap for practical purposes, is not yet ascertained —T. C.]

Charcoal prepared from maple wood, and finely powdered, makes a simple, efficacious, and safe tooth-powder, and ought to be preferred to any other.

[Meat which has been kept too long in summer, may be deprived of its bad smell by putting it in water, and throwing into the pot, when beginning to boil, a shovel full of live coals, destitute of smoke; after a few minutes have elapsed, the water must be changed, when the operation, if necessary, may be repeated. -T. C.]

Meat surrounded by fresh charcoal will keep for months.

Mr. MUSHET of the Carron Iron works, observes, that charcoal is preferable to coke for the manufactory of iron, owing to the superior quantity of unalloyed carbon it affords to the iron. A determinate quantity of charcoal by measure, will smelt and convey principle to three times the quantity of iron, that can be done by the same measure of pit coal. In the refinery it is peculiarly preferable.

The following table was constructed by Mr MUSHET, of the Clyde iron works, from actual experiment of the number of parts of water and gas; of charcoal; and of ashes obtained from 100 parts, by weight, of wood.

* [The charcoal of pine is sometimes hard enough to strike fire with steel: this may arise from siliceous matter in the epidermis or outward bark of the wood —T. C.]

	Water, Hyd gas, Carb. acid	Carbon	Ashes	Colour, Nature, Compactness of the Charcoal.
Oak - - -	76,895	22,682	0,423	Black, close and very firm.
Ash - - -	81,260	17,972	0,768	Shining black, spongy, moderately firm.
Birch - -	80,717	17,491	1,792	Velvet black, bulky and ditto.
Norway Pine -	80,441	19,204	0,355	Shining black, bulky and very soft.
Mahogany -	73 528	25 49[illegible]	0,980	Tinged with brown, spongy, and firm.
Sycamore -	79,200	19,734	1,066	Fine black, bulky and moderately firm.
Holly - -	78,920	19,918	1,162	Dull black, loose and bulky.
Scotch Pine -	83,095	16,456	0,449	Tinged with brown, bulky but pretty firm.
Beech - -	79,104	19,941	0,955	Dull black, spongy, but very firm.
Elm - -	79,655	19,574	0,761	Fine black, moderately firm.
Walnut - -	78,521	20,663	0,816	Dull black, texture close, body firm.
American Maple	79,331	19,901	0,768	Dull black, texture close, moderately ditto.
Do. Black Beech	77,512	21,455	0,033	Fine black, compact and remarkably hard.
Laburnum -	74,234	24,586	1,180	Velvet black, ditto.
Lignum Vitæ	72,643	26,857	0,500	Greyish, resembles pit coal, cokes, ditto.
Sallow - -	80,371	18,497	1,132	Velvet black, bulky, loose and soft.
Chesnut -	76,304	23,280	0,416	Glossy black, compact and firm

An engineer of considerable merit states, that in this respect it is superior to coke in the proportion of 12 to 7. [It is more easily decomposed.—T. C.]

Charcoal is one of the greatest non-conductors of heat. This quality renders it applicable to a variety of economical purposes. [I have a sheet-iron portable furnace, lined with clay, ashes, and salt: this is fixed within a sheet-iron case, so that there shall be the interval of an inch, which is filled up with very dry powdered charcoal. I can make a white heat in the inner furnace, when the outside case shall be no more than warm.—T. C.] See FIRE-PLACES, KITCHEN, LAMP.

Besides these various purposes to which charcoal is daily applied, it also promises to be of considerable service in medicine; on account of its absorbent and antiseptic properties. See BREATH.

From a late account given by Dr. METZLER, an eminent physician in Germany, we learn the following extraordinary fact: The corpse of a person that had been murdered twelve days, was brought before a coroner's inquest, and contrary to the expectation of the court, there was not the least mark of putrefaction, nor any offensive smell perceptible. On opening the intestines of the abdomen, they were found in an unusual dry state.—The cause of this phenomenon was soon discovered; for it appeared, in the course of examination, that the body had been kept for the whole time buried in dry coals, coarsely pounded, at least twelve inches deep. It was still more remarkable, "that the cartilaginous parts, especially those of the breast, had acquired a degree of softness, resembling that of butter."—We submit the application of this singular property to the discernment of our readers.

With regard to the treatment of persons suffocated by the deleterious vapour of charcoal, we shall in this place only observe, that a body in that unfortunate situation, ought to be without delay exposed to the strongest draught of cold air, air should be *gently* introduced into the lungs, by means of a pair of bellows; all the garments loosened; volatile spirits held to the nostrils; the body rubbed either with vinegar, or with a diluted spirit of sal ammoniac; the face should be turned towards the ground, and the head, breast, back &c either washed with, or the whole body suddenly plunged into cold water; then dried, and again washed with vinegar; stimulating clysters repeatedly administered; and venesection performed at the jugular vein, or, for want of medical assistance, a number of leeches applied to the neck and temples.—Of the particular circumstances connected with this treatment, we propose to give a more detailed account, under the head of SUFFOCATION

CHARLOCK, WILD-MUSTARD, CHADLOCK, or CORN-CALE, the *Sinapis arvensis*, L. an indigenous *British* plant, which grows in corn and turnip fields. It is considered in England as a very noxious weed, but is not much known in America

When this plant arrives at maturity, it produces yellow flowers, and turgid, angular pods, containing seed, which

is commonly sold under the name of *Durham mustard seed.*

In Ireland, and the northern parts of Europe, this plant is boiled, and eaten in the same manner as cabbage. It is also relished by cows, goats, and swine; sheep are extremely fond of it; but it is generally refused by horses. Bees derive much nourishment from its flowers.

Instead of being spuriously vended for *Durham mustard,* the seeds of this plant might be rendered more profitable, by expressing the excellent oil with which they abound. This has been attempted with success in Germany; for we are informed by Bechstein, that he obtained thirty pounds of pure lamp-oil, from one hundred pounds weight of the seed.

Charlock, the *Jointed,* or *White flowered.* See Wild Radish.

CHART, an hydrographical map, drawn for the use of navigators, and shewing the situation of coasts, rocks, sand-banks, and sea-marks; the course of currents; the depth of soundings; and the direction of regular winds; the difference, therefore, between the several projections commonly known by the separate names of *maps* and *charts* is very great; and the general appearance, indeed, is so striking as to distinguish them to the eyes of the most ordinary observer.

CHELIDONIUM, *Celandine,* or *Horned Poppy.* There are two species of this genus, indigenous in the United States. 1. C. Majus, greater, or Common Celandine. The juice of the plant is extremely acrid. It is a common remedy for warts, and it is said will cure the itch, tetters, and ring-worms. From the saffron coloured juice of the greater celandine, no *permanent* colour could be obtained; but Rossig, a reputable German author, says, that the whole plant produced by fermentation, a good blue colour, similar to that obtained from *woad* or the *Isatis tinctoria,* L. a fact well deserving the attention of dyers. 2. C. Glaucium, Sea Celandine, yellow horned poppy. This plant is very ornamental to sandy shores, but poisonous.

CHEESE, a food, prepared from curdled milk cleared of the serum or whey, and afterwards pressed and dried for use. The too free use of cheese is not considered wholesome. When new, it is very difficult of digestion; and when old, it becomes acid and hot. Shaved thin, and mixed with hot water, it will form a hard, stony mass; it must, therefore, be dangerous to drink any hot or warm liquor immediately after eating cheese. The whole milk of a dairy, produced at one or two meals, is made into a cheese, the size of which depends on the number of cows in milk. The curd is either that which separates from the skimmed milk after standing, or is more speedily produced by the application of rennet. Rennet is a mixture of aromatics and acid. The cheese differs according to these two descriptions of curd. The cream is skimmed from the milk for making butter. As this article constitutes a material part of domestic consumption, we find in almost every country, one or more places celebrated for the superior quality of their cheese.

I. Stilton Cheese is produced in the town of that name, in the county of Huntingdon; and from its peculiar richness and flavour, is sometimes called *English Parmesan.* The process of making it is as follows: the night's cream is put to the morning's milk, with the rennet; when the curd *is come,* it is not broken, as is usually done with other cheese, but taken out whole, and put into a sieve, in order to drain gradually. While draining, it is pressed till it becomes firm and dry; when it is placed in a wooden hoop, or box, made to fit it, as it is so extremely rich, that without this precaution, it would be apt to separate. It is afterwards kept on dry boards, and turned daily with cloth binders round it, which are tightened as occasion requires. After being taken out of the hoop, the cheese is closely bound with cloths, which are changed every day, till it acquires sufficient firmness to support itself: when these cloths are removed, each cheese is rubbed over daily, for two or three months, with a brush: and, if the weather be damp, or moist, twice a-day: the tops and bottoms are treated in a similar manner every day, even before the cloths are taken off.

Stilton cheese is sometimes made in nets, resembling cabbage nets; but these are neither so good, nor so richly flavoured, as those prepared in the manner before described.

Although the Stilton farmers are in much repute for their cleanliness, they take but little pains with the rennet; as they, in general, cut small pieces from the *vell,* or *maw,* that are put into the milk; and being gently agitated with the hand, break, or turn it, so that the curd is easily obtained. We

venture, however, to say, that their valuable cheese might be improved, and few broken ones occur, if they would prepare the rennet in the manner adopted in the west of England, namely, by keeping the vell, maw, or *rennet-bag*, (as it is differently called), perfectly sweet and fresh; for if it be in the least degree tainted, the cheese will never acquire a fine flavour. When the vell, or maw, is fit for the purpose, a strong solution of salt should be made, with two quarts of soft, sweet water, into which are to be introduced sweet briar, rose leaves, and flowers, cinnamon, mace, cloves, and, in short, almost every kind of spice and aromatics, that can be procured. The whole must boil gently, till the liquor is reduced to three pints, and care should be taken that it be not smoked. The spices should next be strained clean, and the liquid, when milk warm, poured upon the vell, or maw. A lemon may then be sliced into it, and the whole stand at rest for a day or two; after which it should be again strained and bottled. Thus, if well corked, it will keep good for twelve months or longer, possess a fine aromatic odour, and impart an agreeable flavour to the cheese.

II. Cheshire Cheese. The following account of the manner in which Cheshire cheese is made, has been extracted from the celebrated Annals of Agriculture, as written by Mr. Chamberlain of Chester, who thus describes the whole process.—On a farm capable of containing 25 cows, a cheese of about 60 lbs. weight may be daily made, in the months of May, June, and July: the evening's milk is kept untouched till next morning; when the cream is taken off, and put to warm in a brass pan heated with boiling water: then, one third part of that milk is heated in the same manner, so as to bring it to the heat of new milk from the cow. This part of the business is done by a person who does not assist in milking the cows during that time. The cows being milked early in the morning, the morning's new milk, and the night's milk thus prepared, are put into a large tub together with the cream. Then a portion of rennet which has been soaked in water milk warm, the evening before, and sufficient to coagulate the milk, is put into the tub; and, at the same time, if arnatto be used to colour the cheese, a small quantity, as requisite for colouring, is rubbed very fine, and mixed with the milk, by stirring all together. Where arnatto is not used, a marygold or carrot infusion is used in like manner, mixed with the milk. Then covering it up warm, it is to stand about half an hour, or till coagulated, at which time it is turned over with a bowl to separate the whey from the curds, and broken soon after with the hand and bowl, in very small particles: the whey being separated by standing some time, is taken from the curd, which sinks to the bottom. The curd is then collected into a part of the tub, which has a slip or loose board across the diameter of the bottom of it, for the sole use of separating them; and a board is placed thereon, with weights from 60 to 120 pounds to press out the whey.

When it is getting into a more solid consistence, it is cut and turned over in slices several times, to extract all the whey, and then weighted as before. These operations may occupy about an hour and a half. It is then taken from the tub, as near the side as possible broken very small by hand; salted; and put into a cheese vat, enlarged in depth by a tin hoop to hold the quantity, it being more than the bulk when finally put to the press. The side is pressed well by hand, and with a board well weighted placed at the top, wooden skewers stuck round the cheese to the centre; which being frequently drawn out, the cheese is thus drained of its whey. It is then shifted out of the vat, having a cloth first spread on the top of it, and reversed on the cloth into another vat, or even the same; which, however, must be always fresh scalded, and thus made warm, before the cheese is returned into it. The top part is now broken down to the middle, has salt mixed with it and is skewered as before; then pressed by hand, weighted, and has the remaining whey extracted. This done, the cheese is again reversed into a scalded warm vat, with a cloth beneath the cheese. A tin hoop, or binder is also put round the upper edge of the cheese, and within the sides of the vat; the cheese being first inclosed in a cloth, and the edges of it put within the vat. The cheese cloth is of fine hemp, one yard and a half long, and a yard wide. It is so laid, that on one side of the vat it is level with the side of it, and on the other will lap over the whole of the cheese, the edges being put within the vat and the tin fillet going over the whole. All the above operations will take from 7 in the morning till 1 in the afternoon.

Finally, it is put into a press of 18

to 20 hundred weight, and stuck round the vat into the cheese with thin wire skewers which are occasionally shifted. In 4 hours more, it is shifted and turned: and, after another 4 hours again treated in the same manner, the skewering being continued. Next morning, it is turned by the woman who attends the milk, and put under another or the same press, and so, likewise, turned at night, as well as on the following morning. At noon, it is finally taken out, and carried to the salting room; where it has its outside salted, and a cloth binder placed round. The cheese, after such salting, is turned twice a-day, for 6 or 7 days; left two or three weeks to dry, being daily turned and cleaned; and taken to the common cheese room. It is there laid on straw over the boards or floor, and turned every day till it grows hard. This room should be moderately warm, and no wind or draught of air must be permitted to enter, which would generally crack the cheese. Some makers rub the outside with butter or oil, to give them a coat. The spring-made cheese is often shipped for London in the following autumn, and supposed to be much ameliorated by heating on board the vessel.

III. Gloucester Cheese is made of milk immediately from the cow; but which, in summer, is thought too hot, and is, therefore lowered to the requisite degree of heat, before the rennet is added, by pouring in skim-milk, or, if that will not answer, by the addition of water. As soon as the curd "is come," it is broken with a double cheese-knife, and also with the hand, in order to clear it from the whey, which is laded off. The curd, being thus freed from the principal part of the whey, is put into vats, which are set in the press for ten or fifteen minutes, in order to extract all the remaining liquid. It is then turned out of the vats into the cheese tubs; again broken small, and scalded with a pailful of water lowered with whey, about three parts of water to one of whey; and the whole is briskly agitated, the curd and water being equally mixed together. After having stood a few minutes, to let the curd subside, the liquor is poured off; and the former collected into a vat, the surface of which is, when about half full, sprinkled, with a little salt, that is worked in among the curd. The vat is then filled up, and the whole mass turned two or three times in it, the edges being pared, and the middle rounded up at each turning. At length the curd is put into a cloth, and placed in the press, whence it is carried to the shelves, and turned, generally, once a day, till it has acquired a sufficient degree of compactness, to enable it to undergo the operation of washing.

IV. Wiltshire Cheese The milk which produces this cheese is *run*, as it comes from the cow, or as it happens to be *lowered*, by the small quantity of skim-milk mixed with it. The curd is first broken with the hand and dish, care being taken, in first crushing the curd, to let the whey run off gradually, to prevent its carrying away with it the "*fat*" of the cowl. For thin cheese, the curd is not broken so fine as in Gloucestershire; for thick cheese, it is crushed still finer; and, for what is called *loaves*, it is, in a manner, reduced to atoms. The whey is poured off as it rises, and the curd pressed down. The mass of curd is then *pared down*, three or four times over, in slices about an inch thick, in order to extract all the whey from it, pressed and scalded in a similar manner to the Gloucester cheese. After separating the whey, the curd is, in some dairies, re-broken, and salted in the *cowl;* while, in others, it is taken warm out of the liquor, and salted in the vat: thin cheese being placed with a small handful of salt, in one layer; thick ones with two small handfuls, in two layers; *loaves*, with two handfuls, in three or four layers, the salt being spread, and rubbed uniformly among the curd. Wiltshire cheese is commonly salted twice in the press, where it remains, in proportion to its thickness; thin cheese three or four *meals*; thick ones, four or five; and *loaves*, five or six.

Wiltshire cheese is esteemed among the best kinds that are made in England.

[V Cream Cheese. Take of the top or surface cream that has been collected for 3 or four days in the cream-crock so as to be slightly acid, one pint: on each of two common plates lay a dry napkin four-doubled; put half a pint of cream on each napkin. Next day have ready another plate covered with a folded wet napkin, turn the two cheeses one on top of the other upon the wet napkin, cover them over with the ends of this wet napkin, and change it every day for a week till the cheese is ripe. It must not be done in a cellar or damp place, but in a room, otherwise it will mould. Tried. —T C.]

VI [Sap-Sago, or Schap-zugar cheese, is made of common cheese, in the

curd whereof the seeds of the trefoil melilot, *Melilotus odoratus*, dried, powdered, and sifted, have been mixed. The flavour of this cheese is so given, as I know.—T. C.]

VII. The PARMESAN CHEESE is made of the evening's milk, after having been skimmed in the morning, and at noon, and mixed with that of the morning, which has likewise been previously skimmed at noon. The whole is poured into a copper cauldron, resembling an inverted bell, and suspended on the arm of a lever, so as to be moved off and on the fire, at pleasure. In this, the milk is gradually heated to the temperature of about 120 degrees, when it is removed from the fire. As soon as it has subsided, the rennet, in a small bag, is steeped in it; and, being occasionally squeezed, a sufficient quantity of it soon passes into the milk, which is then well stirred, and left to coagulate. In the course of an hour, the coagulation is completed, when the milk is again put over the fire, and raised to a temperature of about 145 degrees: and, while it is heating, the whole mass is briskly agitated, till the curd separates in small lumps. Part of the whey is then taken out, and a little saffron added to the remainder, in order to colour it. When the curd is thus broken sufficiently small, nearly the whole of the whey is taken out, and two pailfuls of water poured in, by which the temperature is lowered, so as to enable the dairy-man to collect the former, by passing a cloth beneath it, and gathering it up at the corners. The curd is then pressed into a frame of wood, resembling a peck-measure without a bottom, placed on a solid table, and covered by a round piece of wood, with a great stone at the top. In the course of the night, it cools, assumes a firm consistence, and the whey drains off. The next day, one side is salted, and on the succeeding day the cheese is turned, and the other side rubbed in a similar manner. This operation is continued for about forty days, when the outer crust of the cheese is pared off, the fresh surface is varnished with linseed oil, the convex side coloured red, and the cheese is fit for use.

VIII. GREEN SWISS CHEESE appears to possess no other peculiarity than that derived from the fragrant powder of the Common Melilot, or the *Melilotus purpureus odoratus*, not the *Trifolium Melilotus officinalis*, L (a native plant of the United States,) which, however, imparts to it a strong flavour, agreeable to most persons: hence it is calculated to become a favourite article in this country, though considerable quantities of Swiss cheese are annually imported for the tables of the luxurious.

IX. DUTCH CHEESE is likewise prepared in the manner generally adopted in Cheshire, with this difference, that the Dutch, instead of rennet, make use of spirit of salt (? T C.) Hence their cheese not only acquires a sharp saline taste, but is also said to be exempt from the depredations of mites: its rich buttery quality must be ascribed to the luxuriant vegetation in the low countries.

[X. SAGE CHEESE. To make this cheese take the tops of young red sage, and having pressed the juice from them by beating in a mortar, do the same with the leaves of spinach, and then mix the two juices together. After putting the rennet to the milk, pour in some of this juice, regulating the quantity by the degree of colour and taste it is intended to give the cheese. As the curd appears, break it gently, and in an equal manner, then emptying it into the cheese vat, let it be a little prest, in order to make it eat mellow. Having stood for about 7 hours, salt and turn it daily for 4 or 5 weeks, then it will be fit for the table. The spinach, besides improving the flavour and correcting the bitterness of the sage, will give it a much more pleasing colour than can be obtained from sage alone.—T. C.]

[*Colouring of Cheese*—The colouring for cheese, is, or at least should be, Spanish arnatto; but as soon as colouring became general, a colour of an adulterated kind was exposed for sale in almost every shop; the weight of a guinea and a half of real Spanish arnatto, is sufficient for a cheese of fifty pounds weight. If a considerable part of the cream of the night's milk be taken for butter, more colouring will be requisite, the leaner the cheese is, the more colouring it requires. The manner of using arnatto is to tie up, in a linen rag, the quantity deemed sufficient, and put it into half a pint of warm water over night. This infusion is put into the tub of milk, in the morning with the rennet infusion; dipping the rag into the milk and rubbing it against the palm of the hand as long any colour runs out.—T. C.]

As no good cheese can be made without good rennet, it may be well to

add the following account of the preparation of that substance, to the mode described by Dr. WILLICH.

"Dairy women usually preserve the maw, and the curd contained in it, after salting them; and then by steeping this bag and curd, make a rennet to turn their milk for making cheese. But a method which seems to be more simple, and is equally good in every respect, is, to throw away the curd, and after steeping it in pickle, stretch out the maw upon a slender bow inserted into it, which will soon be very dry, and keep well for a long time. Take an inch or two of the maw thus dried, and steep it over night in a few spoonfuls of warm water; which water serves full as well as if the curd had been preserved, for turning the milk. It is said that one inch will serve for the milk of five cows."

Hard and spoiled cheese may be restored by keeping it in damp cloths; cover the cheese with them, and put the whole into a cool place, or dry cellar. Repeat this process every day, at the same time turning the cheese; and, if necessary, continue it for several weeks: thus, the hardest and most insipid cheese has frequently recovered its former flavour.

Cheese, being the coarsest and most viscid part of the milk, is digested with difficulty; and therefore calculated only for the more vigorous stomach of the healthy and laborious. Hence, persons of a delicate organisation, as well as the studious and sedentary, ought carefully to abstain from its use; for, when eaten *new*, for instance *cream-cheese*, it is apt to disagree, produce rancid eructations, and impair the digestive organs: when *old*, it has a remarkable tendency to putrify, and taint the breath even of the healthful. After dinner, a very small quantity of sound, old cheese, may do no injury; but it neither assists the digestion of food, nor produces any additional nutriment, when the vessels already abound with alimentary matter. Lastly, we advise those who know the value of health, and are enabled to procure more salutary food, never to make a meal upon bread and cheese alone.

CHEESE-RENNET, or YELLOW LADY'S BED-STRAW, *Galium verum*, L. is a native plant growing on the sides of fields and roads. It has a firm, erect, square stem; short branches, terminating in spikes of small yellow blossoms, appearing in July and August.

The flowers of this plant coagulate boiling milk; and it is, we apprehend erroneously supposed that the best Cheshire cheese is prepared by their influence. When boiled in alum-water, they tinge wool yellow. The roots dye a very fine red, not inferior to madder. They also impart a similar colour to the bones of animals fed upon them. According to the experiments related by Succow, the German chemist, a decoction of the whole plant, when in blossom, on adding vitriol of iron and spirit of salt, produced a fine green colour, which was likewise imparted to wool and silk.

Sheep and goats eat the yellow bed-straw; but it is refused by horses, swine, and cows.

CHEMISTRY is one of the most important branches of Physics, or Natural Philosophy; and implies the knowledge of the component parts of bodies, whether animal, vegetable, or mineral; that is, the art of decomposing *compound* substances; re-producing them, if possible; and ascertaining their physical properties, and relations to each other.

In a domestic point of view, a knowledge of chemistry would seem indispensible. The making of bread, the brewing of beer, making of wine, cyder, and vinegar, the distillation of ardent spirits; the preservation of animal and vegetable foods; the extraction of starch, flour, sugar; the making of butter, and cheese, the making of soap, are all truly chemical processes, which will be conducted with most advantage by those who are best acquainted with the principles connected with them; and it may be safely concluded that were the industrious economists more generally possessed of chemical knowledge, domestic processes would not be often unsuccessful.

To the farmer, a knowledge of the principles of chemistry is no less necessary. By chemistry he will become acquainted with the precise composition of soils and manures; and will thence know how to distinguish the different kinds of earth in his grounds, to judge of the proportions in which they are mixed, and to determine those soils which are most suited to certain crops: to ascertain the different qualities of the various manures, and thus know the proper methods of applying them; to ascertain the best method of improving a poor soil, and to effect by a mixture of earths, what is not to be done by manure alone. Indeed any knowledge that can be acquired on

these subjects, without the aid of chemistry, must be vague and indistinct, and can neither enable its possessor to to produce an intended effect with certainty, nor be communicated to others in language sufficiently intelligible. Thus the expressions, clay, loam, marl, chalk, convey different ideas to different persons, by which all general benefits of experience in agriculture must be greatly limited.

Chemistry may, to farmers, become an universal language, in which the facts that are observed in this art, may be so clothed, as to be intelligible to all nations and ages It would be desirable, for example, when a writer speaks of clay, loam, or marl, that he should explain his conception of these terms, by stating the chemical composition of each substance expressed by them. For all the variety of soils and manures, and all the diversified productions of the vegetable kingdom are capable of being resolved, by chemical analysis, into a small number of elementary ingredients. The formation of a well defined language, expressing the proportion of these elements, in the various soils and manures now so vaguely characterised, would give an accuracy and precision, hitherto unknown, to the experience of tillers of the earth.

[We must refer our readers to the numerous treatises on this subject for further information, as our limits will not allow even of a slight sketch of this most interesting branch of knowledge. —T. C.]

CHERRY, a species of the *Prunus*, L. or plum-tree, a genus of plants, comprising many species, originally natives of Persia; whence they were introduced into Italy, as well as other parts of Europe; and are supposed to have been brought from Flanders into England, in the reign of HENRY the Eighth. The principal species, growing in our climate, are the following:

1. The *Padus*, or bird-cherry, or wild cluster cherry, a shrub which flourishes wild, on almost any soil, if not *wet* (WITHERING); and is found chiefly in the hedges and woods. It bears lopping, and does not stifle the growth of grass. Sheep, goats, and swine eat the leaves, but they are not relished by cows, and refused by horses Its fruit is nauseous; but when bruised, and infused in wine, or brandy, it imparts an agreeable flavour. Its smooth and tough wood is made into handles for knives and whips. The inner bark is said to afford a fine green colour, on boiling it with alum.

BECHSTEIN observes, that this dwarf tree, when transplanted into a rich soil, attains the height of forty feet, and two feet in diameter; and that it thrives most luxuriantly near hedges and waters. As its abundant white blossoms, in May, present a picturesque view, it deserves to be cultivated on the borders of parks and gardens. HOLMBERGER, a Swedish author, remarks, that the dried kernels of this cherry are equal in taste and flavour to almonds, and yield, on expression, a fine and plentiful oil. A decoction of the berries is sometimes successfully given in dysentery.

2. The *Cerasus*, or common wild cherry tree, which is frequently found in woods and hedges, but is probably produced from the stones of the garden-varieties, dropped by birds. It delights in a *sandy* soil, and an elevated situation, and often grows from fifteen to thirty feet in height, but is seldom more than nine inches in diameter. It flowers in the month of May; its sour fruit is eaten by country people, either fresh or dried, and is frequently infused in brandy, on account of its aromatic flavour.

Cherry-trees require to be planted from twenty to thirty feet distant, and to be set deeper in the earth than apple-trees; with the management of which, in other respects, they correspond. Their growth is said to be uncommonly promoted, by laying a composition of lime and night-soil on their young stems, with a brush, which operation has a similar effect on apple-trees.

The best method of raising cherry-trees is, to plant them among hops, in alternate rows with apples, and with two rows of filberts between each; by which means they arrive very speedily at perfection, and thus amply repay the expense and labour bestowed on them at first. The proportion (in the county of Kent, where this species is principally cultivated) is usually, to an acre, 800 hop-hills, 200 filberts, and 40 cherry and apple trees. The hops will stand about twelve years, and the filberts about thirty, by which time the cherry and apple-trees will occupy the whole land.

This species of the *Prunus* is, according to LINNÆUS, the parent-stock, from which many of the cultivated varieties are derived: there are many different sorts, which are known under

the names of Blackheart, Whiteheart, *Flemish*, or early Kentish. Courone, and Hertfordshire black, Cherries All these have been raised originally from stones, and afterwards preserved by budding, and grafting on stocks of the wild black and red cherry, reared for this purpose. In order to ensure a luxuriant vegetation, and a delicious flavour, to these varieties, the stones of the black cherries should be set, or sown, in autumn, to raise stocks; and planted out, the second year after they come up, in lines at the distance of about two feet.

Cherries are said to have come originally from the borders of the Caspian Sea. The following twenty are the principal cherries cultivated in the United States, the account of which was furnished by Mr. WILLIAM PRINCE of Long Island.

May Duke, ripe in May and June: long stem. round and red, an excellent cherry, and bears well.

Black Heart, ripe in June: a fine cherry.

White Heart (or Sugar Cherry) ripe in June: white and red.

Bleeding Heart, ripe in June: a very large cherry of a long form and dark colour; it has a pleasant taste.

Ox Heart, ripe in June: a large, firm, fine cherry.

Spanish Heart, ripe in June.

Carnation, ripe in July, it takes its name from its colour, being red and white, a large round cherry, but not very sweet

Amber, ripe in July.

Red Heart, do.

Late Duke, do.

Cluster, planted more for ornament or curiosity, than any other purpose.

Double Blossom, ripe in July.

Honey Cherry, do. small sweet cherry.

Kentish Cherry, ripe in July.

Mazarine, do.

Morello, do. and August; a red acid, cherry, the best for preserving, and for making cherry-brandy.

Early Richmond Cherry. This fruit originated near Richmond in Virginia, and is the earliest cherry in America, and valuable on that account; it is the size of a May Duke, and resembles it in form.

Red Bigereau, a very fine cherry, ripe in July, of a heart shape.

White Bigereau, ripe in July and August: remarkably firm, heart shape.

Large Double Flowering Cherry. This tree produces no fruit, but makes a handsome appearance in the spring, when it is covered with clusters of double flowers as large as the cinnamon rose; it differs from the common double flowering cherry, which never forms a large tree, and has small pointed leaves.

The three last were imported from Bordeaux in 1798.

[Of these kinds, the May Duke, the White Heart, the Early Kentish, the Morello, the Black Heart, and the Wild Cherry are chiefly worth cultivating. The wild cherry is far preferable to the rest for cherry brandy. The outside skin of the cherry kernels, contains the prussic acid, like the skin of bitter almonds —T. C.]

Those who are disposed to have a greater variety of cherries, will find an account of all that are cultivated in England, given by FORSYTH in his Treatise on Fruit Trees. The following directions for planting, pruning, and training cherry-trees, are given by the same author.

"In the choosing and planting of young cherry trees, the same rules are to be observed that are given for apricots, peaches and nectarines; and they must, in like manner, be headed down the first year.

In pruning cherries never shorten their shoots; for most of them produce their fruit at the extremities, the shortening, or cutting off of which very frequently occasions the death of the shoot, at least of a great part of it. The branches, therefore, should be trained at full length. I have often seen the whole tree killed by injudicious pruning. Wherever the knife is applied it is sure to bring on the gum, and afterwards the canker, which will inevitably kill the trees if no remedy be applied to the wounds. I have headed down a great many cherry trees which were almost past bearing, and so eaten up by the gum and canker, that the few cherries they bore, were very bad.

In the years 1790 and 1791, I headed down fifty trees The operation should be performed in the month of April in each year. These trees made shoots from three to five feet the same summer, bore fine cherries the next year, and have continued to bear good crops ever since.

To the above trees I applied the composition. At the same time I cut down twelve trees in the same row, but did not apply the composition: these twelve trees all died in the second and third years after. One tree

where the composition was applied, now produces more fruit than the whole number formerly, also much finer and larger.

When cherry-trees are very old and much injured by large limbs having been cut or blown off (which will bring on the canker and gum) the best way to bring them to have fine heads, and to fill the vacant space, is to head them down as low as possible, taking care to leave some small shoots, if there be any; if not, a bud or two at the end of some of the shoots. Sometimes it is difficult to find any buds. In that case, before you mean to head the trees, make some incisions in the branches. This should be done on different branches, at the most convenient places for filling the tree with good wood. The size of the incisions should be from one to two inches according to the size of the branches, observing to make them just above the joint where the buds should come out.

The time for performing this operation is March, April, or May, (in America, March.) The above method is only recommended where there are no young shoots or buds, and when the tree is in the last stage of the canker. Where you find a few young shoots or buds, cut down the head as near to them as you can, and take care to cut out all the canker till you come to the sound bark. If any gum remains it must be cut or scraped off: the best time for this is when it is moistened with rain; it may then be scraped off without bruising the bark. This operation is very necessary.

Wherever the bark or branches have been cut off, the edges should be rounded, and composition applied If the the young shoots are properly trained, they will produce fruit the following year; and in the second year they will produce more and finer fruit than a young tree which has been planted ten years.

Never make use of the knife in summer, if it be possible to avoid it, as the shoots die from the place where they are cut, leaving ugly dead stubs, which will infallibly bring on the canker. These shoots may be cut in the spring to about two eyes, which will form a number of flower-buds.

When cherry-trees begin to produce spurs, cut out every other shoot to make the tree throw out fresh wood: When that comes into a bearing state, which will be in the following year, cut out the old branches that remain by that method you will be able to keep the trees in a constant state of bearing, taking the same method as before directed with the fore right shoots.

Great care should be taken to rub off many of them in the month of May (middle of June in America), leaving only such a number as you think will fill the tree. By so doing your trees will continue in a fine healthy state, and not be in the least weakened by bearing a plentiful crop of fruit. The reason is obvious, the great exhalation which would be occasioned by the sun and air in the common mode of pruning is prevented by the composition keeping in the sap which nourishes the branches and fruit. I cut some trees, as directed above, more than twelve years ago, that are now in as good a state of bearing, as they were in the third year after the operation, and likely to continue so for many years.

In 1797 I cut some very old trees in the month of May, which were left, to shew the old method of pruning: I at the same time cut some branches off the same trees, according to the new method, to shew the difference of the fruit, which was taken by all who saw it for a different sort of cherry. The cherries from the old spurs were not half the size of the others, and were at least three weeks later.

Several persons have adopted the new method with great success, and by renovating their old trees which scarcely bore any fruit, have obtained from them an abundant quantity. But even the increased *quantity* of the fruit is not so material, in cherries, as the increase in the *size* and in the *richness of the flavour*. In this respect the method of pruning here laid down, is invaluable. When old standard cherry-trees become decayed and hollow, I would recommend heading them down, as directed for wall-trees and dwarfs. Scoop out all the rotten, loose, and decayed parts of the trunk, till you come to the solid wood, leaving the surface smooth; then use the composition as directed for Fruit Trees."

The common wild or native cherry (*Prunus Cerasus Virginia*) though it bears only a small bitter cherry, which serves as food for birds, is valuable on account of its medicinal bark, and also for its timber, which is of a reddish streaked colour, resembling mahogany, and capable of receiving a fine polish; it is used by turners and cabinet ma-

kers, for many purposes. The tree grows to a large size.

Birds are very fond of the fruit of the wild cherry tree, and they will frequently become intoxicated from eating them. The leaves are poisonous to calves.

CHERRY BRANDY is best made in the following manner.

Fill the cask with an equal proportion of of morello and sweet black cherries; pour over them as much brandy as the cask will contain. When it has been on ten days, draw it off, and pour on hot water, let this remain some time, shaking the cask frequently, then draw it off and mix the last with the first liquor. [It is best made with the small wild black cherry.—T. C.]

CHESNUT, or *Castanea*, L. is a species of the *Fagus* or beech-tree, a genus of plants comprising five species. It flourishes on almost all but moist or mashy situations. Those trees, however, which are intended for fruit, should be raised in nurseries from nuts, removed at least three times, and have the tap-roots cut off, in order to facilitate their growth.

The celebrated chesnut at Tortworth, in Gloucestershire, has been urged, with great probability, as a proof of its being a native of England. That stupendous tree is 52 feet in circumference, and has, according to authentic records, stood there ever since the year 1150, when it was so remarkable as to be called "*the Great Chesnut of Tortworth.*" It fixes the boundary of the manor, and is probably not less than 1000 years old. On the contrary, it has been asserted, that from its being called the *Spanish Chesnut*, it is a native of Spain, and was introduced from that country, at some distant period.

The wood of the chesnut is good for casks, as it neither shrinks, nor changes the taste, or colour, of the liquor. It is also converted into various articles of furniture, and when stained, may be made to resemble in beauty and colour the finest mahogany: this improvement is effected, by rubbing it over, first with alum water, then laying on with a brush a decoction of log-wood chips; and lastly, a decoction of Brazil-wood. Besides these various uses, to which this tree may be applied, its fruit affords an agreeable addition to our winter dessert.

Chesnuts, especially the small esculent sort, form an important article of commerce, in Italy, and in the island of Corsica; which latter alone exports annually such quantities as amount in value to 100,000 crowns. The Germans roast them among embers, and eat them with butter and salt; the French, with lemon-juice and sugar, which agrees better with weak stomachs. This leguminous fruit is also employed in several articles of confectionary; as a substitute for coffee, and in the preparation of chocolate, and as a stuffing for poultry when cooked.

Although these nuts are palatable, and less oily than most productions of a similar nature, yet, when used in abundance, they are not easy of digestion, and ought therefore to be eaten only by the healthy and robust.

MR. WM. PRINCE, of Long Island, informs the editor, that the Spanish or Portugal chesnut succeeds well in the United States, and produces fruit in about seven years from the seed: it grows more rapidly than the American chesnut, the fruit is more than four times as large, and for boiling or roasting is generally preferred.

It may be budded on the common chesnut, but, being of quicker wrowth, is apt to overgrow the stock. It is best to raise it from seed, which, if the trees from which the seeds are taken do not grow too near the common chesnut, will produce the genuine sort.

[The wood of the chesnut may be stained to imitate mahogany. Hop poles and espaliers are made of young chesnut. It is among the best woods for tanning. Starch may be made of the nuts.—T. C.]

2 FAGUS, *Castanea pumila*, Dwarf chesnut tree, or Chinquepin. This seldom rises above eight or twelve feet, otherwise much resembling the chesnut in the appearance of its branches and leaves. Its fruit capsules are small, and generally contain but one conical shaped nut. It grows naturally in a light gravelly soil: when exported the nuts should be put up in sand, when ripe, and sent away immediately, otherwise they lose their vegetating quality.

HORSE-CHESNUT, or *Æsculus*, L. a genus of exotic plants, natives of the East, consisting of four species: the principal of these is the *Hippocastanum*, or Common Horse-Chesnut. It thrives best in rich fat land, but will also flourish on clayey and marley soils.

The horse-chesnut was brought from Asia to Europe, in the year 1550: it is propagated from the nuts, which are gathered in autumn, and set in drills, about three inches asunder. In the spring, young plants will appear, which,

at the end of twelve months, are to be taken up, the top roots shortened, and afterwards planted in a nursery. As soon as they are of a proper size to be finally transplanted, they should be carefully removed, and set in large holes level with the surface of the ground, all the fibres being spread, and covered with fine mould. A stake should then be placed, to protect them from high winds, and the depredations of cattle, till they are of a sufficient size to defend themselves.

This tree grows so rapidly that, in the course of a few years, it becomes large enough, in groves and alleys, to afford a good shade during the heat of summer, when it is in full bloom. Its fruit furnishes a grateful food to horses, and has been successfully employed for fattening cattle, the tallow of which it renders uncommonly firm, especially when mixed with ground barley. The milk obtained from cows fed with it, is also said to be richer than that produced by any other aliment. The nuts have likewise been used with advantage in feeding poultry; but they are unwholesome for hogs. Deer are peculiarly fond of this fruit: which has also been usefully substituted for soap; because on steeping and boiling it in water, it makes a good lather, preparatory to the use of that more expensive article. There are, besides, various other purposes to which horse-chesnuts may be rendered subservient in the arts and manufactures.

CHEST, in commerce, a kind of measure, which contains an uncertain quantity of various commodities Thus, a chest of sugar holds from 10 to 15 cwt.; a chest of glass from 2 to 300 cubic feet, of Castile soap, from 2½ to 3 cwt; of indigo, from 1½ to 2 cwt.; computed at 5 score to the hundred.

CHEWING, or mastication, is the action of the teeth, by which solid food is broken, and divided into smaller particles: thus, being at the same time mixed with the saliva, it is better prepared for digestion, both on account of its pulpy state, and the solvent nature of the fluids, secreted by the salival glands, during the exertion of the adjacent muscles. Hence it is obvious, that those persons, who are in the habit of swallowing their meals with expedition, and afterwards, inundate the stomach with large potations, do themselves a double injury: 1. Because their food passes through the stomach only half digested—affording but a scanty supply of real nourishment; and 2. Their saliva is, against the order of nature, constantly determined to other emunctories, so that it will, sooner or later, produce cutaneous, and painful diseases.

CHICK, or CHICKEN, the young of the gallinaceous order of birds; especially of the common hen.

From the importance of this bird, as constituting a delicate and agreeable food, especially to invalids, the means of hatching, and rearing it, have long exercised the ingenuity of speculators.

The manner in which they are hatched in ovens, by the Egyptians, is well known, but has not answered in Europe. They are best left to the care of the hen.

To fatten chickens expeditiously, take a quantity of ground rice and an equal quantity of common flour; mix sufficient for present use with milk and a little coarse sugar; stir the whole well over the fire, till it makes a thick paste; and feed the chickens in the day time only, by putting as much of it as they can eat, but no more, into the troughs belonging to the coops. It must be eaten while warm; and, if they have also beer to drink they will soon grow very fat. A mixture of oatmeal and treacle, combined till it crumbles, is said to form a food for chickens, of which they are so fond, and with which they thrive so rapidly, that at the end of two months they become as large as the generality of full-grown fowls fed in the common way. But no common fowl is to be compared with a capon thus fed.

CHICKEN POX, or SWINE-POCK, *Varicella*, is a disorder in itself of so little consequence, that we should not have mentioned it, if this affection were not frequently confounded with the SMALL-POX. The chicken pox generally appears without any previous illness; though, in some cases, chillness, cough, loss of appetite, and a slight fever, precede it, for two or three days On the first appearance of the eruption, the pustules are of a reddish hue; and, on the succeeding day, small vesicles are formed at the top of the former, containing a colourless, or sometimes yellowish, watery fluid. On the third day, the pocks arrive at maturity; after which they gradually die away, leaving a slight scab, which, however, does not extend to the true skin, and produces no mark This cutaneous affection is seldom attended with serious indisposition, so that medicines are but conditionally required

and often unnecessary. A few drops of antimonial wine may, nevertheless, be advantageously given, in order to excite a more speedy and uniform perspiration, and consequently to promote recovery.

CHICKLING VETCH. See VETCH.

CHICKWEED, or *Alsine*, L. a genus of plants, comprising five species, of which that most generally known in England is the *media*, or common chickweed.

It grows in almost every situation, whether damp or even boggy woods, or the driest gravel walks in gardens. In its wild state, this plant frequently exceeds half a yard in height, and varies so much from the garden chickweed, that if a person were acquainted only with the latter, he would with difficulty recognise it in the woods. On account of its upright flowers, which blow from March to October, it may be considered as a natural barometer; for, if they are closed, it is a certain sign of approaching rain; while, during dry weather, they are regularly open, from nine o'clock in the morning till noon.

This species affords a striking instance of what is called the *sleep of plants*. Every night the leaves approach in pairs, so as to include, within their upper surfaces, the tender rudiments of the new shoots: and the uppermost pair, but one, at the end of the stalk, is furnished with longer leaf stalks than the others, so that it can close upon the terminating pair, and protect the end of the branch.

The Rev Mr. SHAW remarks that chickweed is an excellent out-door barometer; when the flower expands boldly and fully, no rain will happen for 4 hours and upwards; if it continues in that open state no rain will disturb the summer's day; when it half conceals its miniature flower, the day is generally showery; but when it entirely shuts up, or veils the white flowers with its green mantle, let the traveller put on his great coat, and the ploughman, with his beasts of draught, rest from their labour. [This observation is likely to be true in England, experience must test it here.—T. C.]

[Chickweed and groundsel are the common food for canary birds, and cried about the streets of London daily for that use.—T. C.]

CHICORIUM INTYBUS. Wild Endive; which, by the experiments of Mr. WAKEFIELD and others in England, seems of prodigious consequence for the supply of summer feed. It has been sown broad cast, but appears to answer best in drills. It has yielded from 20 to 40 tons of green fodder per acre. In America it would be particularly suitable for summer feed, as the roots seek nourishment from a great depth.

This root is perennial and has generally been regarded in the light of a noxious weed; it has, however, for several years past, been cultivated in France as food for cattle. In Lombardy, it is sown, mixed with other herbs of pasture, and cut three or four feet high. It is reputed there to increase both the milk and flesh of cattle, and to be very nutritious when made into hay. Horses eat it greedily; and it is an important object for summer soiling both for them and cattle. It is also freely eaten by sheep.

Chicory defies drought, being of early growth. The stalks are so thick and stiff as to support themselves against winds and the heaviest rains. The most severe cold does not injure it. The quickness of growth renders it very valuable, because it furnishes abundance of salutary fodder at a season when green food is scarce. It has been found to grow seven inches in three weeks, whilst sainfoin and burnet grew only four inches. Two cuttings may be made of it the first year, and three or four, according to the season, every year after, in May, July, August, and October, or in May, July, and October, never letting it stand till it become hard and sticky; or it may be cut continually, by beginning again when the whole piece is gone over, and thus yield a constant supply of fresh food during seven or eight months.

The produce is said to be superior, upon the whole, to that of Lucerne, in the proportion of three to one. A piece of ground sown with chicory, was found to yield, by the acre, the year of sowing, at two cuttings, July the 24th, and October the 17th—19 tons, 4 cwt. Second year, at three cuttings, May 21st, July 24th, and December 3d—38 tons, 9 cwt. And the average produce of four years, was near thirty tons.

[I consider the Wild Chicory, or Succory, *Chicorium Intubus*, as the best of plants calculated for the summer feed of horses and cows, when cut and given in the farm-yard. It can be cut four times a-year. Its roots furnish the very best substitute for coffee yet known. They should be cleaned, put into the oven when the bread is taken

out, and left to cool. Repeat this. Use one half chicory, so treated, with one half coffee. I speak from personal knowledge of this plan, in both respects.—T. C]

The leaves of the cultivated chicory, endive, when *blanched,* form an ingredient in early spring salads. See ENDIVE.

CHILBLAIN, in medicine, is a small tumour, or ulcer, in the hands, feet, heels, &c. It is occasioned either by exposing warm parts too suddenly to a cold temperature; or by holding the hands, or feet, when cold, too suddenly to a considerable degree of heat. Such affections always have a great tendency to mortification, in which they frequently terminate.

Children of sanguine habits, and delicate constitutions, are most liable to chilblains; which may be prevented by such remedies as invigorate the system; by wearing flannel socks, from the beginning of September to the latter part of spring, and occasionally taking gentle laxatives, when they are disposed to become costive. All these precautions, however, will be attended with no benefit, if young people are suffered to repair to the fire, immediately after coming from severe external cold.

In the commencement of this complaint, immerse the part affected, several times a day, for a few minutes, into cold water, and guard against sudden vicissitudes of heat and cold; as either are equally hurtful But, if simple water procure no speedy relief, dissolve an ounce of salt-petre in half a pint of vinegar and an equal quantity of water, and foment with it the part affected every night. When the tumours will not yield to these applications, and still remain in a swelled and painful state, without producing ulceration, a few drops of the pure tincture of *benzoin* may be rubbed occasionally on them; and the parts should be defended against the external air, by soft linen cloths: from this simple treatment, we have experienced the best effects

CHILD The duty of a child to a parent, arises from the sacrifice of ease and comfort, and the voluntary expense and labour incurred by a parent to promote the comfort of a child Our law relating to children wants alteration A young man and young woman, seduced by their affection and their passions, have a child: they repent and marry. If it happens that they defer the marriage till after the child is born, it is a bastard; and thus the *innocent* child, is punished by the cruel bigotry of our laws, for the crime of the guilty parent! This might suit the obstinate and bigotted barons of king John's or king Henry's time, but it is a vile disgrace to the American code By the civil law, marriage legitimatises children born before that contract —T. C]

CHIMNEY, in building, is that part of a house, where the fire is made; and which is provided with a tube, or funnel, to carry off the smoke.

Notwithstanding the magnificence of the Grecian and Roman architecture, it is very doubtful whether their common dwelling houses had chimnies; for they made use both of stoves, and holes cut in the roofs of their houses, to admit the free egress of smoke. But as VIRGIL mentions chimnies, we may infer, that they were not wholly unknown to the ancients

[*Method of building Chimnies that will not smoke* —Contract the space immediately over the fire, so that you may be sure of the air being well heated and rarefied *there* · this will ensure a current upward All chimneys should be carefully built, and every joint well filled with mortar, so as to prevent communication in case of the chimney catching fire.—T. C]

Smoky chimnies are frequently occasioned by their being so very narrow as scarcely to admit the children, usually employed for the purpose of sweeping them, to reach properly to the top. This evil may be remedied, and that inhuman practice rendered unnecessary, by adopting the following mode, which has been used for time immemorial in Edinburgh, Glasgow, and other cities in the North, and which effectually answers the end intended.

Procure a rope for the purpose, twice the length of the height of the chimney, to the middle of which is to be tied a bush (of broom, furze, &c) sufficiently large to fill the chimney. Put one end of the rope down the whole passage, and, if there be any windings in it, a bullet, or round stone, is to be tied to the extremity of the rope, and the wood end of the bush introduced after the rope has descended into the chamber, where a person must pull it downwards. By the elasticity of its twigs, the bush sweeps the sides of the chimney as it descends, and carries the soot with it. Should it be necessary for the man at the top, who has hold of the other end of the rope, to draw the bush up again, the

person below must turn the latter, so as to send the wood-end uppermost, before he gives notice to the assistant at the top to pull it upwards. Chimnies thus cleaned, never require one-tenth part of the repairs, rendered necessary where they are swept by children: for, as these are obliged to work themselves up, by pressing their knees and feet on one side, and their backs on the other, they not unfrequently force out the bricks that divide the chimnies. *This is the chief cause why, in many houses of cities, a fire in one apartment always fills the adjoining ones with smoke, and sometimes even the neighbouring house. Whole buildings* have often *been burnt down*, from this concealed cause; as a foul chimney, taking fire, communicates it by these apertures to empty apartments, or to such as were filled with lumber; and in which it was thought unnecessary to make any search, after the fire had been extinguished in the chimney where it first began. We, therefore, seriously recommend this practice to be universally adopted, as an object of interest, not less than on account of its humane tendency. It would, farther, be no detriment to those who procure their subsistence by the sweeping of chimnies: for, if this plan should be countenanced, they would be as necessary, then, for the convenience of the public as they are at present; and those very persons would be unavoidably induced to provide themselves with ropes for that purpose. Lastly, such a beneficial change might afford the only practicable means of rescuing many unfortunate children from their degraded situation; prevent many accidents by which they become deformed; and obviate the evils attendant on a premature old age. See FIRE-PLACES.

Chimnies lined with mortar, in which salt has been mixed, it is said, will not retain soot. This was a discovery of a countryman in New-Jersey. [Has it been tried?—T. C.]

CHIMNEY SWEEPING. Smoke in its passage through a chimney deposits a considerable quantity of soot, which is apt to take fire, and also to fall back into the room. It is therefore necessary frequently to have the flues cleansed and the soot removed from them. The usual method in this country is by means of coloured children, who are from a very early age forced up chimnies, sometimes at the hazard of their lives, always at the risk of their health. The evils of this unwholesome occupation have from time to time engaged the attention of the humane, and some years since a premium was offered, in England, for the best mechanical invention that should supersede the necessity of climbing boys. There were many candidates for the prize, which was after repeated examinations and experiments adjudged to Mr. GEORGE SMART, the patentee of a method of making hollow masts. As his method, though by no means perfect, in the practice has been a good deal used in and about London, we shall give an account of its mode of operation. The principal parts of the machine are a brush, some rods or hollow tubes, that fasten into each other, by means of brass sockets, and a cord connecting the whole together. The method of using the machine is this, having ascertained, by looking up the chimney, what is the direction of the flue, a cloth is then to be fixed before the fire-place, with the horizontal bar, and the sides to be closed with two upright bars. The brush is introduced through the opening of the cloth, which opening is then to be buttoned, and one of the rods is to be passed up the cord into the socket on the lower end of the rod which supports the brush; the other rods are in like manner to be brought up, one by one in succession, till the brush is raised somewhat above the top of the chimney, observing to keep the cord constantly tight, and when those rods which have a screw in the socket are brought up, they are to be placed on the purchase; the cord is to be put round the pulley and drawn very tight, and screwed down, by which all the rods above will be firmly connected together, and the whole may be regarded as one long flexible rod. In pulling the machine down, the edges of the brush striking against the top of the chimney, will cause it to expand, and there being a spring to prevent its contracting again, it will bring down the soot with it. In drawing down the machine, the person should grasp with his left hand the rod immediately above that which he is separating with his right hand, to prevent the upper ones from sliding down too soon. The rods, as they are brought down, are to be laid carefully, one by one, in as small a compass as possible, and arranged like a bundle of sticks.

This machine has been found of great utility in extinguishing fires in chimnies, for that purpose a thick coarse

cloth well drenched in water, is to be tied over the brush, and then forced up the chimney in the manner directed. The whole invention is very honourable to Mr. SMART's talents, but there still requires an addition to the machine, which will act the part of the chimney sweeper's scraper.

CHINA. See PORCELAIN.

CHINCHILLA (*Mus laniger*), a small Chilese quadruped of the rat tribe, which has a beautifully soft grey fur. This was formerly used by the Peruvians as their finest wool, and was spun and woven into stuffs of extremely delicate texture, to which they attached great value. Of late years however the manufacture of it has been much neglected. As a fur, the skin of the chinchilla is much in request in this country, in consequence of its having become a fashionable trimming for ladies' dresses, and a favourite article for muffs

CHINCOUGH, or Whooping-cough, a contagious disease, which at first resembles a common cold, though it is from its commencement attended with a difficulty of breathing, and the eyes are protruded from their sockets. It generally attacks children; to whom, if mismanaged, it frequently proves fatal. Hence the necessity of parents to pay unremitting attention to those circumstances which aggravate the complaint. But, if the cough become so violent that respiration is occasionally suspended, and when the patient breathes again, is accompanied with a shrill whooping noise, no time should be lost to remove him to a different air, whether it be more or less pure, provided it is at some distance from his former residence. The diet in this disorder should always be light, but nourishing; and if no fever prevail, meat may be allowed in moderate quantities. Give neither cold nor hot drinks, but toast and water, of which the chill is taken off; gruel; decoctions of sago, tapioca, arrow-root, &c. If the cough be attended with febrile symptoms, and the child be strong, the loss of a little blood will be highly useful in moderating the violence and frequency of the cough. Purges of calomel and rhubarb or jalap, are also very proper, to be occasionally administered During the operation of these remedies diluting drinks ought to be given. A gentle emetic of vinegar of squills, or antimonial wine, sweetened, given early every other morning, for several days, will tend greatly to moderate the violence of the cough. Children bear the operation of emetics in a surprising manner in this disease. A plaster of Burgundy pitch applied between the shoulders is also beneficial in moderating the cough. Three or four drops of *laudanum* given twice a day in a spoonful of mint water, produce a good effect in the *decline* of the complaint, by abating the cough, which sometimes continues merely from habit. A *change of air* is very useful to moderate the violence of the cough.

Dr. FERIAR says he has found FOWLER's mineral solution efficacious in stopping the violence of the cough. In doses of about 4 drops twice a-day to a child of seven years old for instance.

CHINESE WHEEL, is an engine employed in the province of Kiang-see, and probably through the whole empire, for raising water from rivers to irrigate plantations of sugar canes, on a sandy soil, considerably elevated above the level of the river According to Sir GEORGE STAUNTON, who says it is ingenious in its contrivance, cheap in its materials, easy in its operation, and effectual in its purpose, the wheel is from 20 to 40 feet in diameter, according to the height of the bank and elevation to which the water is to be raised Such a wheel is capable of sustaining with ease 20 tubes or spouts, of the length of four feet, and diameter two inches in the clear. The contents of such a tube would be equal to six-tenths of a gallon and a periphery, of 20 tubes 12 gallons. A stream of a moderate velocity would be sufficient to turn the wheel at the rate of four revolutions in one minute, by which would be lifted 48 gallons of water in that short period, in one hour, 2,880 gallons: and 69,120 gallons or upwards of 300 tons of water in a day

CHINQUAPIN See CHESNUT.

CHLOROSIS, a disorder which frequently attacks females after the age of puberty. It is attended with a depraved appetite, and a desire to eat substances that are not food, such as chalk, ashes, salt, &c; the skin is pale and discoloured; the face sallow or greenish, but sometimes of a livid hue; there is a deficiency of blood in the veins: with a soft swelling of the whole body, especially the legs during the night; debility; palpitation; and suppression of catamenia.

Causes. A sedentary life; scanty, or indigestible food; obstructions of the bowels; and frequently also, inordinate passions.

Cure. Although the experience of all ages has attested, that the most certain relief in this female complaint is a change from a single to a connubial state, yet as this expedient is not always convenient, the following plan should be steadily pursued: A nourishing diet, with an allowance of generous wine, in small quantities; abstinence from acids, spirituous liquors, and whatever may suddenly heat or cool the body; moderate daily exercise especially on horseback; or, if that cannot be procured, general friction of the whole frame with warm flannel every morning and evening; sleeping on mattresses, instead of soft feather beds; early rising, and cheerful company. Beside these general regulations, it will be useful to keep the bowels continually open, by taking small doses occasionally of any gentle cathartic. To bathe the lower extremities frequently in warm water, and to wear worsted stockings in preference to silk or cotton; to apply the steam of hot water with due precaution; and lastly, to resort to the tepid bath every other day, or as often as is compatible with the strength of the patient. If, nevertheless, these gentle means prove unsuccessful, the more powerful remedies, such as chalybeates, bitters, mercurials, &c. must be prescribed by the profession. In some of the most tedious and inveterate cases of chlorosis, almost immediate relief was obtained by inhaling dephlogisticated air, or oxygen gas, which, however, should be administered only by persons sufficiently acquainted with the nature of that powerful agent.

Although *Chlorosis* is frequently attended with the appearance of general dropsy, it is easily discriminated from that disease: there is no diminution of urine; frequently that secretion is in great quantities, and limpid. Sometimes chlorosis is accompanied with cough, which, joined to the difficulty of breathing, affords a suspicion of hectic, but it is not attended with the fever and flushing of the cheek, which mark the disease.

Supposing the disease to be ascertained, if there be turgescence of the belly and costiveness, a gentle purgative of aloes or rhubarb may be premised; and the use of chalybeates commenced. The best form of this medicine, is that called *prepared steel*, which is no more than simple rust of iron. The following prescription may be taken with great advantage. Prepared steel, 1 oz. Powder of Peruvian bark ½ oz. Mix and divide into 12 doses, one of which may be taken morning and evening, in syrup. The same composition may be taken in the form of pills made up with *syrup of rhubarb*, two to be taken three times a-day.

Exercise on horseback, and early rising, are indispensible remedies in this complaint. The air and scenes ought to be changed.

CHOCOLATE-TREE, *Theobroma Cacao*, L. is a native of the West Indies, and South America, attaining the height of 16 feet. From the fruit of this tree Chocolate is thus prepared: The nuts are gently parched, to separate their external covering; the kernels are triturated on a smooth warm stone, and a little arnatto is added. When sufficiently triturated, it is put quite hot into tin moulds, where it congeals in a very short time. This is the common chocolate, as prepared in England from the cocoa alone, without any other ingredient. Sometimes, however, a small quantity of sugar, or of vanilla is added, for improving its taste. As these cakes are very liable to contract good as well as bad scents, they should be carefully wrapped up in paper, and kept in a dry place.

Good, unadulterated chocolate, ought to possess the following properties: a brown colour inclining to red, and rather lively than faint; a smooth surface not affected by mere contact of the hand; a fine and uniform consistence on breaking it, without granulated particles, which arise from the addition of sugar employed by the manufacturer to conceal still baser ingredients, lastly, it should easily melt in the mouth, and leave no roughness or astringency, but rather a cooling sensation on the tongue. This last quality is the most decisive criterion of genuine chocolate.

Considered as an article of diet, chocolate is a nutritive, and, in general, wholesome food, well adapted to the weak stomachs of invalids and valetudinarians. If duly prepared, and not too much roasted in the nuts (which imparts a dark, rather than reddish colour to the cakes,) it is easily dissolved in a liquid state; and, being quickly assimilated to alimentary matter, it is less flatulent, and oppressive, than most vegetable dishes of a viscid, and oily nature. To promote its digestion, it ought not to be used without the addition of aromatic spice, such as cinnamon, cardamoms, vanilla, &c

which last, however, must be sparingly employed, as it is one of the most heating and stimulating drugs

The Spanish chocolate has been long famous for its superiority over that of every other part of the world. Two causes may conspire to establish this superiority. 1. The richness of the nuts, which are obtained from the province of Caraccas, and 2. The care taken in the manufacture. The following is the recipe by which the Spanish chocolate is made: To six pounds of nuts, add 3½ lbs. sugar, seven pods of vanilla, and 1½ lb. flour of Indian corn, (zea mayz), 1½ lb. of cinnamon, 6 cloves, one drachm (60 grs.) of capsicum (long pepper); a sufficient quantity of rou-cou nut to improve the colour, and ambergris or musk to give an agreeable flavour.

In the common way, to 17 lbs. of nuts are added 10 lbs. sugar, 28 pods of vanilla, one drachm of ambergris, and 6 oz. cinnamon. The ambergris and musk, may be safely omitted.

Chocolate, it is well known, constitutes the breakfast and supper of two-thirds the Spanish nation, and it is to be regretted that it is not more used in the United States. During the winter, it certainly is a preferable breakfast to coffee, both in respect to the labour, which it will enable a man to perform, from the stimulus or temporary strength it affords, and also from the nourishment which it communicates to the human system When properly boiled with milk, it certainly is preferable to any other breakfast.

As chocolate disagrees with many stomachs, it may be proper to observe, that the shells of cocoa when boiled in water, (after being washed), with the addition of milk, form a very pleasant article of diet.

[In New England the chocolate makers adulterate with the seeds of broom-corn, and use butter, too apt to turn rancid.—T C.]

[CHOKE-DAMP. A collection of carbonic acid gas, with or without a mixture of azotic or nitrogen gas, found in mines, wells and pits. It will neither support life or flame Hence where a candle will not continue to burn, a man cannot continue to live. In wells, this gas may be expelled by lowering down a pipe open at top and bottom and making a good fire at the upper end of the pipe so as to force a current of air through the lower end of the pipe. Such a pipe may be of tin, wood or leather; taking care to guard the upper end from being burnt; and so managing the current of air that the whole or greater part must ascend from below.

Or, the foul air may be pumped out by means of a temporary piston fixed in a tube adapted to the end of leather hose. No man should be permitted to descend into a well or pit, till a candle has first been let down, to ascertain whether the air at the bottom will sustain life.

Quick-lime, and gunpowder, are inadequate remedies to expel or absorb the choke damp —T C]

CHOLERA MORBUS. A violent vomiting and purging This is a common disease in the United States during the summer months, and most commonly proceeds from an intemperate use of spirituous liquors, improper articles of diet taken in the evening for supper, or exposure to night air, while sleeping thinly covered.

If the discharges be not very violent, they ought to be encouraged by magnesia and rhubarb, or effective doses of castor oil, with *moderate* draughts of warm water, or weak chamomile or centaury tea (*Chironia Angularis*), when the offending cause is removed, ten or fifteen drops of laudanum may be given in water every fifteen minutes, until ease be procured. If spasms in the stomach and legs occur, as they sometimes do, a tea-spoonful of æther may be given in a wine-glass of water, taking care not to approach the candle with the medicine. The legs must also be well bathed with laudanum, and rubbed with a flesh brush. Clysters of warm water and molasses ought also to be injected every hour for three or four hours, to evacuate the bilious effusions which commonly take place in this complaint.

CHONDROPTERIGIOUS, a term applied by the Linnæan system to an order of fishes with cartilaginous gills. Dr. SHAW, and other naturalists, have united the branchiostegi and chondropterygii under the general title of cartilaginei. Linnæus separated the cartilaginous from the other fishes, and placed them in the class Amphibia, where they constituted the order Nantes

This distribution was made under the supposition of the cartilaginous fishes being furnished both with lungs and gills The supposed lungs, however, have been since ascertained by naturalists to be only a modification of the gills, and it, therefore, now appears

that this cartilaginous tribe consists in reality of fishes, differing principally, if not entirely, from other fishes, in having a cartilaginous skeleton

CHORD, in music, the union of two or more sounds uttered at the same time, and forming together an entire harmony

CHORD of an arch is the right line joining the extremes of that arch.

CHORDS. See INSTRUMENTS.

CHOROGRAPHY, the art of delineating or describing some particular country or province: it differs from geography as a description of a particular country differs from that of the whole earth; and from topography as the description of a country from that of a town or district

CHOROIDES, denotes the coat of the eye immediately under the sclerotica.

CHROMATICS, that part of optics which explains the several properties of the colours of light, and of natural bodies. On this very intricate subject no theory has been yet advanced against which formidable and perhaps unanswerable objections may not be brought. The Newtonian doctrine authorises the following aphorisms: "1. All the colours in nature proceed from the rays of light. 2. There are seven primary colours, *viz.* red, orange, yellow, green, blue, indigo, and violet. 3. Every ray of light may be separated into seven primary colours. 4. The rays of light, in passing through the same medium, have different degrees of refrangibility 5. The difference in the colours of light arises from its different refrangibility: that which is the least refrangible producing red; and that which is the most refrangible, violet. 6. By compounding any two of the primary colours; as red and yellow, or yellow and blue, the intermediate colours, as orange, or green, may be produced. 7. The colours of bodies arise from their dispositions to reflect one sort of rays, and to absorb the other; those that reflect the least refrangible rays appearing red; and those that reflect the most refrangible, violet. 8. Such bodies, as reflect two or more sorts of rays, appear of various colours. 9. The whiteness of bodies arises from their disposition to reflect all the rays of light promiscuously. 10. The blackness of bodies proceeds from their incapacity to reflect any of the rays of light."

[CHROME. A semi-metal found in red masses and chrystals combined as an oxyde with the oxyde of lead, in Siberia. Found also as an oxyde combined with the oxyde of iron in soapstone (steatite) in France, and in the line of the soapstone and chlorite from Philadelphia or 12 miles from thence on the West Chester road, to the Bare hills, 8 miles from Baltimore, and thence to Loudoun county, Virginia: probably further in the same S. W. line.

It is used to make the fine yellow pigment, the chromate of lead. For which purpose, one part of the chromated iron, well levigated, is mixed with half a part by weight of nitre, and exposed to a full red heat for 6 or 8 hours. It is then suffered to cool, levigated, washed in hot water, which being filtered contains the chromate of potash (the oxyde becoming acidified by means of the decomposed nitre.) It contains also uncombined potash, and undecomposed nitre. The uncombined potash is saturated with vinegar, and then the solution is used to precipitate sugar of lead in solution. If the solutions are concentrated and strong, the colour will verge toward an orange yellow, but if diluted, and the sugar of lead in a little excess, the colour will be a lemon yellow.

The chromate of lead is yellow.

The chromate of silver fine red.

The chromate of mercury reddish orange brown.

Chromate of copper brown.

Oxyde of chrome is green.

White arsenic takes away oxygen from the chromic acid of chromate of potash, and reduces it to a green oxyde. Hence it is an excellent test for the presence of arsenic, as Judge Cooper, the editor of this work, first discovered.

Put in a wine glass, or on a watch glass, the sixteenth of a grain of white arsenic, add to it a drop or two of chromate of potash, and in two hours the liquor will assume a beautiful green colour. This is an important test in cases of poison.

Oxyde of chrome gives a most beautiful emerald green colour to glass. It can be reduced to an acid and procured in reddish but deliquescent chrystals. It can be converted into a semimetal by abstracting the oxygen from its oxyde.

The chromate of potash, is obtainable in yellow chrystals: the super-chromate of potash in the most beautiful ruby-coloured chrystals. T. C.]

CHRONOLOGY treats of time, the method of measuring its parts, and of

adapting these to past transactions for the illustrating of history. This important branch of knowledge is founded upon astronomy. By laborious calculations the date of remote events is attempted to be ascertained; but with what degree of certainty, the disputes among chronologers may enable the world to guess. We are told that, "They count 132 contrary opinions concerning the year in which the Messiah appeared upon earth: among all these authors, however, there are none that reckon more than 7000 years, nor less than 3700; but even this difference is enormous."

Upon this disputed point, we copy the following condensation of the argument from Judge COOPER's Introductory Lecture at Carlisle.

[I adopt the Septuagint version, in preference either to the Hebrew or Samaritan text, or Samaritan version.

1st. Because, without adopting the fabulous account of ARISTÆUS, and his seventy-two interpreters, it appears to me likely, that the most authentic copy of the Jewish Scriptures, would have been furnished or sought out for the purpose of that version: whether undertaken at royal instigation, or by private persons from private motives. It would naturally be the interest, equally of the Jewish nation, and of the learned men of the day, that this should be the case Neither does there [illegible] to be any adequate assignable reas[illegible] why genealogical or chronological m[illegible]ons or interpolations, should [illegible] ce: nor could any alteration of the [illegible] chronology have passed without observation, under the circumstances of a version that must have attracted much notice at the time

2dly. Some slight variations have crept into the copies even of the Septuagint. Thus according to Eusebius and the Septuagint, the interval from the Creation to the Flood, is 2242 years; according to Josephus and the Septuagint 2256 years; according to Julius Africanus, Epiphanius and the Septuagint 2262 years: but these are so slight, as to corroborate the general authenticity of the version

3dly. The quotations out of the Old Testament, made not only by Jesus Christ and his Apostles, but by the more ancient fathers also, are allowed to be from the Septuagint version or its original being in many places conformable to this copy, and differing from the Hebrew text. I refer generally for proofs of this, to PEZRON's Antiquité de Tems Retablíe, and the second chapter of Carpzovius, page 526 et seqq. 4thly It is notorious that the christians of the three first centuries universally counted 5500 years from the creation to the birth of Christ. This is distinctly admitted by Jos. SCALIGER in his Prolegomena in Chron. Eusebii. 5thly. The best qualified among the moderns as well as among the ancients, to judge of this question, have preferred the Samaritan version. Was not JOSEPHUS capable of adopting the most authentic chronology of his own country, himself a Jew? WALTON in his Prolegomena, Is. VOSSIUS in his Chronologia Sacra, PEZRON, and though last not least. Dr. KENNICOT, may be mentioned as approving by preference of this version. Dr. KENNICOT has laid the christian world under great obligations, by his most elaborate edition of the Hebrew Bible with various readings, printed at Oxford under the patronage of George the Third. A work that occupied the learned editor upwards of twenty years. 6thly. I confess myself prejudiced in favour of that copy, which harmonises most easily with authenticated facts of profane history.

I do not know that any point of faith depends upon disputed points of chronology: and if such were the case, it is impossible to harmonise the Hebrew text and Samaritan version, in this respect, either with each other, or with the Septuagint version. Besides, there is more latitude for mistake, and for error of copyists, in the numeral passages, than in any other. Hence in law proceedings, the English practice, properly requires that dates should be in words at length. Nor is it possible to reconcile MANETHO or JOSEPHUS with any text extant: or PEZRON with PETAU; or NEWTON, WHISTON, MARSHAM, BEDFORD, the BISHOP of CLOGHER, and USHER, with each other. I have formerly tried this, but in vain. Hence it seems to me, conducive to the fair and reasonable interest of christianity, to lean to that edition of the scriptures, which best accords with facts established on defensible grounds, and that affords the least occasion, either for the plausible objections, or unreasonable cavils, of those who do not acknowledge the divine authority of the scripture books. The authorities and arguments on the chief points involved in the controversy respecting the Septuagint version, are learnedly and laboriously collected

by J. G. CARPZOVIUS in his Critica Sacra, 4to, Leipsig 1728, which is in this college. The summary of the same kind, contained in STRAUCHIUS's Brev. Chronolog. translated by SAULT (p. 166-178) is not here.—T. C.]

The admirable divisions of time into years, months, days, hours, minutes, and seconds, have given a general precision to the notions of mankind; taught us what regular history is; and enabled us to transmit to posterity a legacy that may remove, rather than multiply, its errors.

A day, in common discourse, usually means that period of time during which the sun remains above the horizon; but, in a philosophical sense, it denotes the time of a complete revolution of the earth about its axis. The beginning of the day is variously reckoned by different nations: some reckoned it from sun-set, some from sun-rise, and in most European nations the day is computed from mid-night, but modern astronomers count the day from noon, the time at which the sun is on the meridian The Jews and Romans divided their day into four watches; the first commenced at six in the morning, the second at nine, the third at twelve, and the fourth at three in the afternoon. In the same way the night was divided.

The division of time into weeks is arbitrary. The Greeks divided their time in portions of ten days each, the Chinese in those of fifteen, and the Mexicans in those of thirteen days. But the Jews, Oriental nations, and many others, have used weeks of seven days

The month was suggested by the phases of the moon, and hence months were originally lunar. They are divided into astronomical and civil The astronomical months are measured by the revolutions of the moon, and the civil month is that space of time by means of which the solar year is divided into twelve months. The length of the lunar month, or the time taken up between one new moon and the next, is 29 days, 12 hours and 44 minutes.

The year is measured by the motion of the earth round the sun, and it was formerly divided into twelve months of 30 days each; but it is now divided into months of thirty and thirty-one days each, excepting February, which contains twenty eight days, but every fourth year February contains twenty-nine days. JULIUS CÆSAR ordained the year to consist of 365 days 6 hours, which is 11 minutes too long; the true length of the year is 365 days, 5 hours, 48 minutes and 48 seconds. To regulate this so as to make even days, it is now agreed that the common year shall consist of 365 days; but every fourth year, called leap year, is to consist of 366 days, and to avoid the excess which this would occasion, every hundredth year is common, and contains only 365 days, such was the year 1800, excepting every four hundredth year, which is to have 366 days, such will be the year 2000 In the greater part of Europe, the new style was introduced towards the close of the 17th century, but it was not admitted into England till the year 1752, when it was determined that the year should commence on the 1st of January instead of March, as it had formerly.

Chronology not only treats of the division of time into portions of years, months, &c. but shews the application of these portions under various forms, as cycles, æras, &c. to the elucidation of history. Cycles are fixed intervals of time, composed of the successive revolutions of a certain number of years: the principal cycles in use among chronologers are.

1 The Lunar Cycle, which is a period of 19 years, at the end of which interval the sun and moon return to very nearly the same part of the heavens This cycle, on account [illegible] utility in determining the [illegible] of EASTER, is called the Golden Number." The first year of the Christian æra corresponds with the second of this cycle. To find the golden number, or year of the lunar cycle, add one to the given year, and divide by nineteen, the quotient shows the number of cycles which have revolved since the Christian æra, and the remainder, if any, is the golden number for the year.

Example for the year 1812.

$$\frac{1812+1}{19} = \frac{1813}{19} = 95 \text{ and } 8 \text{ over}$$

Therefore there have been 95 complete cycles since the birth of Christ, and the golden number for the year 1812 is 8 When there is no remainder, as will be the case in the year 1823, then the golden number will be 19.

2. The Solar Cycle consists of 28 years, when the sun returns to the sign and degree of the ecliptic which he occupied at the conclusion of the preceding period, and the days of the week correspond to the same days of

the month as at that time. The first year of the Christian æra corresponds to the ninth of the solar cycle. If therefore 9 be added to any given year, and the sum be divided by 28, the quotient denotes the number of the revolutions of the cycle since the ninth year before Christ, and the remainder will be the cycle.

Examples for 1811 and 1812 :

$$\frac{1811+9}{28}=\frac{1820}{28}=65.$$

$$\frac{1812+9}{28}= 65 \text{ and 1 over};$$

So that the year of the cycle of the sun for the year 1811 is 28, and for the next it will be 1.

3. There is also another cycle, called the Cycle of the Roman Indiction, which, as it has no connexion with any celestial motion, is only mentioned to say that its year is found by adding three to the given year and dividing by 15.

What is called the grand Julian Period is formed by the combination of these cycles, that is, by multiplying the three numbers into one another; thus, 19 × 28 × 15 = 7980; this is the number of years of which the Julian period consists, at the expiration of which, the first years of each of those cycles, will come together.

The first year of the Christian æra corresponds with the 4714th of the Julian period, which is 710 years before the common date assigned to the creation of the world: therefore to find the year of the Julian period corresponding with any given year *before* or *since* the Christian æra: in the *former* case, subtract the year from 4714, and the *difference* is the answer: in the latter case, add 4714 to the given year, and the *sum* will be the year required.

Example for the year 1812.

1812 + 4714 = 6526,

which is the year of the Julian period. Epochs and æras may be thus explained: an *epoch* is a certain point generally determined by some remarkable event from which time is reckoned; and the years computed from that period are denominated an æra. Thus, the birth of Christ is reckoned an epoch; the years reckoned from that event are denominated the Christian æra.

The most remarkable epochs are: (1) That of the creation of the world, which, by modern chronologers, is supposed to have happened 4004 years before Christ. (2). The universal deluge, computed from the year 2348, before Christ. (3) The call of Abraham, B C. 1921. (4). The departure of the Israelites from Egypt, B. C. 1491. (5) Sir Isaac Newton has made use of the Argonautic expedition as an epoch to reckon from, which is supposed to have happened 1225 years before Christ

The Christian æra is dated from the birth of Christ, which is supposed to have happened 4004 years after the creation, and 1819 years before the present period.

[Chronology of the Hindoos. Herodotus (Euterpe 142) and Plato, were certainly deceived by the Egyptian priests, whose chronological frauds, as Sir Isaac Newton observes (Chronology p 6.) did not escape Diodorus Siculus, who controverts their ten thousand years of regal and priestly succession, as founded on manifest imposition. As to the tables of the Chinese, and the modern Hindoos, mythological and historical, they outrage common sense too palpably, to afford the slightest ground of belief. But in rejecting their Avatars, and their hundreds and thousands of years of ancient history, it does not appear to me that we have a right as yet to reject the æras apparently founded on *astronomical observation*. This question has been well discussed, as it well deserves to be, by M Le Gentil, in his Voyage dans les Mers de l'Inde; M Bailly in his Traitè de l'Astonomie Indienne et Orientale, and by Professor Playfair of Edinburgh in the second volume of the Edinburgh Transactions, who are in favour of the high antiquity of the Indian Tables.—And by Dr Marsden in the Philosophical Transactions for 1790, and Mr. Bentley in the 6th and 8th vol. (quarto) of the Asiatic Transactions, in his remarks on the antiquity of the Hindoo rule of calculation, the Soorya Viddvantes, or Sooria Viddantam; who dispute them M. de la Place is not quite satisfied that the observations registered in the Hindoo tables of Astronomy, were actually made 3102 years before the Christian æra, at the Indian period of the Kaly-Youg; but is nevertheless willing to admit of such observations at a period even earlier than that. The following is a very brief sketch of the controversy.

The gentlemen who adopt the period of the Kaly-Youg, shew.

1st. That at various times, and without the possibility of communication or preconcert, four sets of astronomical tables have been transmitted to Europe from different parts of the east.

M. de la Loubere, ambassador from Louis XIV. to Siam, brought home from thence in 1687, tables and rules for the calculation of eclipses. He found also in the place where the naval charts were kept, two manuscripts containing Hindoo astronomical tables, deposited there by M. de Lisle then deceased: of these tables, one set was presented to M. de Lisle by Pere Patouillet correspondent of the missionaries in India, the other came from Pere Duchamp, who procured them from the Bramins, at Krisnapouram, or Chrisnabouram, (for there is no settled rule of spelling or pronouncing Hindoo names.) The tables given by Pere Patouillet, are presumed to have come from the neighbourhood of Narsapoor, a town belonging to the English in the northern Circars, as they contain a rule for determining the length of the day, for latitude 16° 16′ north.

In 1772 M. Gentil brought home other tables of Hindoo astronomy procured from the Bramins at Tirvalore, a town in the Carnatic, in lat. 10° 44′. These four sets of tables, were deposited with the Academy of Sciences at Paris. All these tables appear calculated for meridians not far from Benares, the great depository of all Hindoo science. The Siam tables, suppose a reduction of one hour and thirteen minutes of time, or 18° 15′ of longitude, which refers to the meridian of Benares. The Tirvalore tables, correspond with the Hindoo æra, Kaly-Youg, or rather 27 hours 32 minutes and 30 seconds after it, or 18th February, at 6 in the morning, 3102 years A. C. The Kaly-Youg, commencing on the 16th.

2dly. The tables of Siam sent over in 1687 imply astronomical knowledge unknown in Europe, until the publication of the tables of Cassini and Mayer many years after that date.

3dly. These tables assign values to nine different astronomical elements, which do not belong to them at the present day, but which the theory of gravity proves to have belonged to them at the æra of the Kaly-Youg: viz. *The inequality or procession of the Equinoxes*, which they calculate at 54 seconds a-year, whereas the motion of the stars from west to east is found at present to be only 50 seconds a-year.—*The acceleration of the moon's motion*, which according to Mayer is about 9″ more in one age than in the preceding: this in 4801 years would amount to 5° 45′ 44″: making this correction, the difference between the moon's mean place at the commencement of the Kaly-Youg, and that assigned by the tables of Tirvalore, is no more than 37″, the tables of Mayer giving 10° 6′ 37″ and the Tirvalore tables 10° 6′. This calculation could not be founded on the tables of Ptolemy at Alexandria, nor on the tables of Ulugh Beig at Samarcand, commencing July 4th, 1437, because they give different results. Nor on the Arabian tables, for the Arabians employed those of Ptolemy; and so did the Persians in their tables of Chrysococca and Nassireddin.—A third element is *the length of the solar year*, which Bailly and Playfair investigate much at large.—A fourth is the *equation of the sun's centre*; this, which according to De la Caille is 1° 55½′, depends on the eccentricity of the earth's orbit, which is subject to alternate diminution and increase. Making the requisite corrections, the Tirvalore tables will be erroneous but 4, at the æra of Kaly Youg: an approximation to truth, that late astronomical discoveries alone could have announced.—A sixth element is *the place of Jupiter's Aphelion*. The methods of calculating correctly hereon, were not known in Europe till M. de la Place, the best astronomer now living, ascertained the periods of the mutual action of Jupiter and Saturn on each other, and their inequalities thence resulting. Making the needful corrections pointed out by modern discovery, the calculations of the Hindoo tables are precisely right—the *equation of Saturn's centre*—and the *inequalities of motion* in these two planets, stand upon the same method of proof.

To these may be added the following considerations.

1st. Mayer's Tables, I believe, first pointed out the small but regular acceleration of the moon's motion: Le Grange first shewed that all the variations in our system are periodical: and a full exposition of what is known concerning the apparent irregularities of the planetary bodies from their mutual action on each other, and the calculations thence indicated, we owe to Le Place in his larger work the "Mechanique Celeste;" of which I observe a very instructive abridgement as it should seem, lately published, Exposition du Systeme du Monde, translated into English in two vols. by Mr. Pond

of the Royal Society (30 Ed. Rev. 354) Hence the presumption is, that the observations in those tables must have been actually made; and not founded on any theory, or subsequent calculation: for no rules of calculation known either in India or in Europe, till of late days comparatively, would have enabled them to approach so near to the expression of real fact. The astronomical knowledge of 150 years ago, would not have led but misled them.

2dly. All the late accounts of Indian knowledge, tend to shew that the most learned of the Bramins do not comprehend at all, the theory of the rules by which they calculate either mathematical or astronomical questions. I refer generally to the Asiatic Researches and the Asiatic Miscellany; where I know this remark is repeatedly made: but as I have not the books now at hand to consult, I cannot refer to the passages. So Father Du Camp relates, that when the Bramins at Krisnapouram were at a loss, or committed mistakes, they used to say, "this would not have happened if we now understood the *Sooria Siddantam.*"

3dly. M[illegible] curious reasoning corroborative of Bailly and Playfair's arguments might be drawn from astronomical observations connected with the well of *Syene*, and the Zodiacs of Tentyra, (or Dendera) and of Esnè: for which see De Non's travel's, large [illegible], and Hamilton's Egyptiaca. The [illegible]unts also that we have of these tables, co[illegible]ate, and are corroborated by the [illegible]count given of the Babylonish tables [illegible] at the command of Alexander by Calisthenes to Aristotle. These reached as is said to 2234 years before the Christian æra, and were 19[illegible] years earlier than the incursion of Alexander. Taking for granted the inclination to forgery in this respect, how happens it, that all these forgeries at various times, and at various places, by learned men, not communicating with each other, should all coincide in exhibiting a correctness of astronomical knowledge, hardly yet possessed by European astronomers?

Dr. Marsden, and Mr. Bentley object,

That according to M. Bailley's own calculations, there could not have been at the moment indicated by the tables of Tirvalore, a conjunction of all the planets, for there was no less than 73 at that time between the places of Venus and Mercury, which is not compensated by shewing that when the sun and moon were in opposition 15 days after, all the planets but Venus being comprehended in the space of 17° might be visible. This argument is also strengthened by similar observations of La Place. To which no reply is obvious excepting that the expression of the tables is general, that there was a conjunction of the planets, without saying of all of them.

2dly. Dr. Marsden says that both Le Gentil and Bailly are egregiously mistaken in their supposition of the Hindoo method of calculating by cycles of 60 years, and that their theory of this calculation does not coincide with the date of the Kalee Youg which began in the 13th year of the cycle 60.

3dly. Mr. Bentley in his examination of the Soorya Siddyantes, or Hindoo system of astronomical computation, makes it comparatively of modern origin; and concludes that the calculations of the tables were made backward by theory, from the date of some accurate and actual modern observations. For his calculations on this head, the reader may consult the 6th vol. of the Asiatic Researches, and his reply to objections in the 8th vol. of the same work.

4thly An objection has been taken to this supposed antiquity of the Hindoo calculations from the Mosaic account of the Deluge. Whether that event was universal, covering every part of the earth at one and the same time, as the literal expressions of Moses certainly imply, has been doubted and controverted; on the ground, that we are not compelled to understand the Mosaiacal account to relate to any part of the earth but what was known to Moses at the time. Doubtless, the marks of the sea having at some time or other covered the land, are to be found in almost every climate and latitude of our globe. Most of the deluges noticed in profane history are partial. Mr. Kirwan who has published a very learned defence of the Mosaic account, treats it as a case that includes a dignus vindice nodus, and disclaims all explanation but what is grounded on an exertion of miraculous power at the time. Wherein doubtless he is right I wish however in the next edition of his Geology, he would explain the fact noted by himself that no secondary mountain rises more than 6000 feet above the level of the ocean. I do not think Cuvier's remark stands much in the way, viz. that in the caves of the great chain of calcareous mountain

extending for 600 miles, nearly from the Hartz to the plains of Hungary (which I do not apprehend to be primitive) there are no bones of marine animals, or any thing that marks the presence of the sea.

However, this is a question connected with theological considerations, wherewith as a chemist I have nothing to do. Nor does the objection stand at all in my way. According to the computations founded on the Septuagint, the interval from the creation to the Birth of Christ, comprehends 5872 years. According to EUSEBIUS and the Septuagint, the interval from the Creation to the Flood was 2242 years. Hence the æra, Kaly Youg, or 3102 years before Christ, will be 528 years after the flood. Nor is it to be supposed, (adopting the Mosaic account of the deluge) that no traces of former knowledge, were retained by NOAH and his family. This will leave time enough for a series of observations in an eastern climate, on which the tables in question might have been grounded. The faulty chronology of the Hebrew text, has been the real parent of this difficulty.

Such is the best view I can give of the arguments on both sides of this very curious, but very knotty question.

An extract from LA PLACE on the subject, may be found in 30 Ed Rev. 371. and a view of this controversy somewhat different from mine and of which I have made no use, in 8 Dobson's Encyc. 519. The preceding objection drawn from the universality of the Mosaic deluge however, belongs I believe to the compiler of that article, who might have spared himself the trouble of stating it, had he duly attended to the most authentic chronology of the Mosaic history.

"Non nostri est tantas componere lites." But as I have before observed, I do not see where the modern Hindoos could have found the knowledge necessary for the purpose of computing those tables backward, from a given set of modern observations. It is but of late days, that the Europeans have possessed any data for calculating the disturbances in the planetary motions arising from their mutual action and reaction

"If the Hindoos have it, then must that knowledge be grounded on a series of exact and actual observations, which can hardly be referred to a date more modern than the æra contested. I have seen nothing further on this controversy, excepting a slight notice of it under the article astronomy, in the new Encyclopædia lately published at Edinburgh under the direction of Dr. BREWSTER; in which the compiler of that article, is by no means satisfied with the reasoning of Mr. BENTLEY, but adheres to the opinions of PLAYFAIR and PLAYFAIR.

For my own part, I see nothing that a christian has to object to the antiquity and reality of the Hindoo observations, at or near to the æra of the Kaly-Youg. I adopt therefore, the chronology of the Septuagint version. According to the modern English chronologers who follow the Hebrew text and Archbishop Usher, 4004 Years elapsed from the creation to the birth of Christ. Taking the chronology of the seventy, that interval consisted of 5872 years: according to the Samaritan, of 4700. On which of these conflicting systems, has orthodoxy stampt the impression of infallibility? Suppose we adopt the Septuagint translation, which I have no doubt of shewing to be the most worthy of acceptation: then deduct 3102 from 5872, and it will allow 2770 years for the world to acquire the requisite knowledge of astronomy to compose astronomical tables such as the Hindoo, at the commencement of the æra of Kaly-Youg! And where is the extravagance or improbability of this supposition? It has hardly taken a fourth part of that time in Europe —T. C.

CHRONOMETER. See LONGITUDE.

CHRYSALIS, or AURELIA, in natural history, is a term expressing that form of butterflies, moths, and other insects, which they assume, while in a state of rest and apparent insensibility; before they arrive at their winged or most perfect state. This transformation, says HERDER, a celebrated German author, affords a beautiful emblem of a man's passage to a future life

"The form of the chrysalis generally approaches that of a cone: while the creature is in this state, it appears to be destitute both of legs and wings, to have scarcely power to move; and, in short, to be almost devoid of life. It takes no nourishment, nor has it indeed any organs for that purpose: its posterior part is all that seems animated, which has the power of motion, in a very slight degree. The external coat of the chrysalis is cartilaginous, of a considerable size, generally smooth and glossy, though some of them have a few hairs, while others are as hairy as the caterpillars from which they are

produced; and again, others are rough, and in a manner shagreened.

When first produced, the chrysalis is soft, and the front of it moistened with a viscous liquor, which surrounds the wings, legs, &c ; as it hardens almost immediately, all those limbs that are before separated, are consolidated into a mass. Having undergone its change, in this state, it perforates the shell with its head, and bursts forth into day, in its winged form.

In every species, there may be distinguished two sides; the one of which is the back, and the other the belly, of the animal. On the anterior part of the latter there may always be observed certain little elevations running in ridges . the other side, or the back, in most of the chrysalises, is smooth, and of a rounded figure : but some have ridges on the anterior part and sides of this part, usually terminating in a point and making an angular appearance. From this difference is drawn the first general distinction of these bodies, by which they are divided into two classes ; the round and the angular. The first French naturalists call *feves ;* the chrysalis of the silk-worm being of this description, and so named. This division is extremely convenient to classification, the *phalanæ* or moths being almost universally produced by the rounded chrysalises, and the *papilios,* day-flies, from the angular Among the latter, are some whose colours are as worthy of observation as the forms of others Many of them appear superbly clothed in gold. These species obtained the names of *chrysalis* and *aurelia ;* derived, the one from a Greek, the other from a Latin word, signifying gold; and from these, all other bodies of the same kind have been called by the same names.

CHRYSOLITE, or *yellowish-green topaz,* a precious stone of a grass-green colour, found in the East Indies, Brazil, Bohemia, Saxony, and Spain ; in Auvergne and Bourbon, in France, and in Derbyshire in England (The chrysolite of the ancients was the same gem that is now called *topaz ;* the propriety of which application of the word is obvious.) [It is found at Haddam Connecticut —T C.]

CHRYSTALS Common Quartz, is a hard and foliated substance, usually of a white or grey colour, and more or less transparent.

It is generally found in shapeless masses, which are nearly thrice as heavy as water, and the fracture of which is glassy. When chrystallised, it most commonly has the form of a six-sided prism, terminated by a pyramid of six sides.

This kind of stone forms a constituent part of many mountains, and is very common in our own, as well as in most other countries. It is sufficiently hard to scratch iron and steel when rubbed upon them in powder; and it has the property, after having been several times successively made red-hot, and dipped into water, of communicating to that fluid a certain degree of acidity.

Quartz is employed, in place of sand, for making the finer kinds of glass ; and also in the manufacture of porcelain. For the latter purpose great quantities are collected from the mountains of Wales, ground into powder, and in that state shipped to Liverpool, and other parts After having been burnt and reduced to powder, it is also mixed with clay, and formed into bricks for the construction of glass furnaces : these are capable of resisting the effects of the intense heat which is requisite in the fusion of glass.

Rock Chrystal, is an extremely beautiful kind of quartz, sometimes perfectly transparent, and sometimes shaded with grey, yellow, green, brown, or red It is generally seen in the form of chrystals with six sides, each terminated by a six-sided prism.

It is chiefly found in the hollow veins of rocks ; and we are informed that the crevices of some parts of Mont Blanc and the Alps contain it in such abundance as to be perfectly bristled with it.

The name of this substance was considered by the ancients to signify ice, or water chrystallised ; and they imagined that chrystal was produced from a congelation of water.

Its uses are very numerous. It is cut into vases, lustres, and snuff-boxes; and many kinds of toys of extremely beautiful appearance are made of it. When pure and perfectly transparent, it is much in request by opticians, who make of it those glasses for spectacles which are called pebbles, and who use it for various kinds of optical instruments. The best chrystal is imported from Brazil and Madagascar, in blocks, not unfrequently from fifty to a hundred pounds in weight. It is sold at various prices, from five to twenty shillings a pound, according to its quality.

Chrystal was held by the ancients in great estimation, and the most valua-

ble kind that they were acquainted with was obtained from the Island of Cyprus; but it was often faulty in particular parts, having flaws, cracks, and blemishes. When, as was frequently the case, chrystal was used for the engraving of intaglios and cameos, the artist could sometimes conceal these defects amongst the strokes of his work; but when it was to be formed into cups or vases this could not be done, and for the latter purpose the purest pieces only could be employed.

In the county of Cornwall, in the neighbourhood of Bristol, and amongst the mountains of North Wales, small chrystals of this kind are frequently found, which are respectively called *Cornish*, *Bristol*, and *Snowden* diamonds.

Some chrystals contain in their substance drops of water, or other kind of fluid; and these, as curiosities, are usually sold at a rate considerably higher than others. There are in the British Museum specimens of chrystal which inclose various kinds of foreign substances, such as iron stone, needle antimony, and asbestos.

The coloured kinds of chrystal are indebted for their different tints to the oxides of different kinds of metals. These are often confounded with the precious stones; and as such are made into rings, necklaces, broaches, ear-rings, and other female ornaments. The following are the principal of them.

Common Amethyst is a violet-coloured chrystal, which is occasionally cut into rings, seals, and boxes. It acquires a considerable brilliancy in polishing, and is sometimes of sufficient size to be formed into columns of more than a foot in height, and several inches in diameter. The best of these amethysts are brought from the neighbourhood of Carthagena in Spain.

Amethysts are valued in proportion to the depth of their colour, and to their perfect transparency. The most favourite form in which they are made up is in necklaces; and as it is not easy to find a number of perfect stones with precisely the same tint of colour, necklaces of this description are very valuable. The finest that is known is in the possession of the Queen of England. The amethyst being almost the only coloured stone that can be worn with mourning, derives from this circumstance a considerable addition of value.

We are informed by Mr. Mawe, that the best amethysts of this description are brought from India and Ceylon; and that, although they are commonly called Oriental amethysts, they must be carefully distinguished from the true Oriental amethyst, which is a much more valuable gem. Those next in esteem are found in Brazil, and are procured in the mining districts of that country, at considerable expense. Siberia and various countries in Europe, especially Germany and Spain, furnish inferior though beautiful amethysts, proper for snuff-boxes and other inlaid articles.

False Ruby is a chrystal of red colour, and found in Bohemia, Silesia, and Barbary

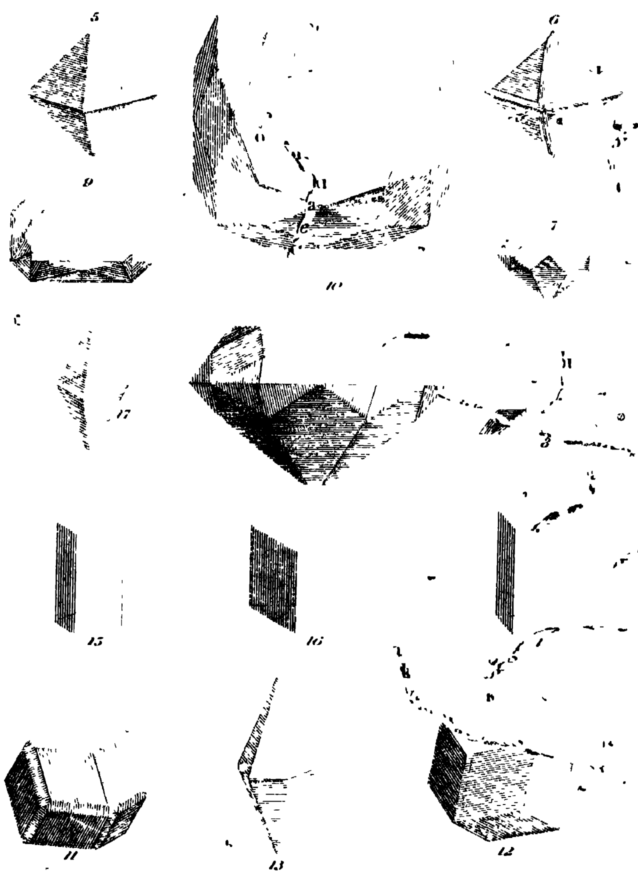
False, or *Water Sapphire* is a blue chrystal, which does not differ much in appearance from the true sapphire, but is considerably less hard This kind is found in Bohemia, Silesia, and some parts of Switzerland, but is not so valuable as the last

False Emerald is a green variety of chrystal, the scarcest and most valuable of all the coloured kinds. It is chiefly found in Saxony and Dauphiny.

Yellow, or *Topazine*, *Chrystal* is a stone of wine yellow colour. It is found in Brazil and Bohemia, but has no other alliance with the true topaz than its colour; and the latter is often only internal.

Cairn Gorum Chrystals are obtained in various parts of Scotland, but particularly from a mountain of that name in the county of Aberdeen. They are usually of smoky yellow, or brown colour, and are at this time so much in request for ornamental articles of dress, that several lapidaries have been induced to settle in Aberdeen, who are constantly employed in cutting them for seals, rings, necklaces, broaches, and other trinkets of various kinds When these chrystals are of deep and good colour, they are nearly as estimable as topazes; and if clear and large are sold at a high rate. The price of inferior seal stones varies from ten shillings to three or four pounds each; but those of superior beauty will produce from five to ten guineas. Those specimens which have a pure and full yellow colour are often sold as topazes When they are muddy, the lapidaries have the art of entirely dissipating the colour, and giving them a transparent lustre. This is done by means of heat, which will dissipate the colour of every species of chrystal.

CHRYSTALS &C.



Explanation of the Plate of CHRYSTALS.

FIG.

5. Octohedron.
6. Rough diamond.
7. Profile of a brilliant cut stone.
8. Profile of a rose cut stone.
9. Plane of a table cut stone.
10. Plane and profile of the Pitt diamond.
11. Dodecahedron.
12. Rough garnet.
13. Six-sided pyramids, lengthened and joined base to base.
14. Regular four-sided prism.
15. Six-sided prism.
16. Cube.
17. Four-sided pyramid having a rhomb for a base.

[CHRYSTALLISATION. The regular determined form that every mineral body in nature will put on, if it have room for the particles to exert the peculiar attractions—the regularities of their respective sides. All bodies that appear under no regular determined form of sides and angles, do so appear, either from being prevented from assuming their characteristic form, by want of perfect solution, want of space, or by compression of surrounding substances. The system of chrystallisation, and the act of distinguishing mineral substances in all their varieties by the forms of chrystallisation which they assume, was first suggested by ROME DE LISLE, and is now chiefly maintained by the Abbé HAUY. But,

1st. Few minerals are well chrystallised.

2d. The same form of chrystals with the same dimensions of angles belongs to various minerals. M LUCAS has given a list or table of them in his mineralogy. See also Mr PHILIPS's paper in vol. 4 of the Geological Transactions.

3d. The same minerals both as to chemical composition, within narrow limits of constituent parts, and as to external and physical characters, do not always put on the same form of chrystal See on this subject the papers of Mr. BEUDANT. Hence the very plausible not to say probable position that all minerals consisting of the same chemical constituent parts, will alway assume when at full liberty, the same form of chrystal; cannot *yet* be considered as proved for practical purposes. It is however generally true of all the salts called neutrals under *the same circumstances;* but circumstances vary so much, that the application of the theory to practice is greatly narrowed It appears to me that the theory of chrystallisation, determines the mode of juxta position among the particles of living organised bodies, vegetable and animal. *They obey in this respect* certain laws of opposition as well as of assimilation. Hence the removal of flesh, of the claws of a lobster, &c — T. C.]

CHUB, or *Cephalus*, L. is a species of the *Cyprinus*, a numerous genus of fish. It is mostly found in holes overshadowed by trees, where these fish are seen floating during warm weather, in great numbers.

Chub being very full of bones, afford but an indifferent dish; yet they furnish considerable amusement to anglers, as they may be easily taken The best mode of fishing for them is the following: Prepare a very strong rod of sufficient length, and fix to the hook a grasshopper, beetle, or any other large fly. This must be dropped gently at a small distance from the fish, which will bite immediately, if it does not see the angler, who should take the precaution of concealing himself from it; as, being extremely timid, this fish sinks to the bottom, on the slightest alarm, and not unfrequently at the passing of a shadow. In March and April, it may be caught with large red worms, in June and July with flies, snails, and cherries, but in the months of August and September, the proper bait is good cheese pounded in a mortar, with some saffron and a small quantity of butter. The best season for this fish is winter, as the flesh is then more firm, and better tasted. During cold weather, the angler should keep his bait at the bottom, when it will be eagerly seized.

CHURCH, in religious affairs, is a word which is used in several senses 1. The collective body of persons professing one and the same religion, or that religion itself. thus, we say, the Church of Christ. 2 Any particular congregation of Christians associating together, as the Church of Antioch. 3. A particular sect of Christians, as the Greek Church, or the Church of England. 4 The body of ecclesiastics, in contradistinction to the laity. 5. The building in which a congregation of Christians assemble. [6 The Scripture definition of a Church (cætus credentium, an assembly of Believers) is that of Jesus Christ, " Where two or three are gathered together in my name, there will I be in the midst of you."—T.C.]

CHURN, a vessel in which butter. by long and violent agitation, is separated from the serous part of milk

The inferiority of the churns in common use, has induced several ingenious mechanics to exert their skill in contriving others, that would render the process of making butter less tedious and expensive. Of two of these we shall give a succinct account.

The first is Mr. WILLIAM BOWLER'S improved CHURN, for which the Society for the Encouragement of Arts, Manufactures, and Commerce, liberally gave him thirty guineas, in the year 1795.

This churn is of the barrel kind, being a cylinder, 18 inches in diameter, and 9 wide; the sides are of wood, (tin would be better on account of the greater ease with which it may be cleansed) the rim a tin plate, which has two openings; one 8½ inches in length, and 4 in width, through which the cream is poured into the churn, and the hand introduced for cleaning it; the other, a short pipe, one inch in diameter, by which the butter-milk runs out of the churn, when the operation is finished. The first of these openings has a wooden cover, fastened down by two screws; and the other a cork fitted to it, while the butter is churning. There is farther, near the larger opening, a small vent-hole, with a peg to admit the passage of any air that may be discharged from the cream, at the beginning of the operation. An axle also passes through the churn, terminating in two gudgeons, on which it hangs; its lower part being immersed in a trough, in order to hold occasionally either hot or cold water according to the season of the year. On the inside of the rim, are four projecting pieces of wood, with holes, serving to agitate the cream by the motion of the churn. This movement is caused by a pendulum 3 feet 6 inches long, that has an iron bob, weighing 10 lbs. and at its upper end a turning pulley, 10 inches in diameter, from which a rope goes twice round another pulley, about 3 inches in diameter, fixed on the axis of the churn, which it causes to make a partial revolution, by each vibration of the pendulum.

There are likewise sliding covers to the machinery, and also another to the water trough; in order, when hot water is used, to secure the steam, and keep the cream in a proper degree of warmth. The motion of the pendulum is given, and continued, by means of a wooden rod, about 3 feet 9 inches in length, which turns on a pin 3 inches above the bob of the pendulum.

Explanation of the Engraving which represents Mr. William Bowler's improved Churn.

A, A, The body of the churn, of tin

B, An opening, by which the cream is put in.

C, The cover of the large opening. The small hole on the opposite side cannot be delineated in the print.

D, The axis, or gudgeon, on which the body of the churn is suspended.

E. The upper, or large pulley.

F, The smaller pulley fixed on the axis of the churn.

G, G, The rod of the pendulum, hanging from the upper pulley E.

H, The bob of the pendulum.

I, I, The handle, moveable on the pin at *a*, by which the pendulum is moved, making a traverse in the form of the dotted line K, K.

L, The trough for the hot or cold water.

To be made of tin because a better conductor of heat than wood.

M, A projecting piece of wood, with a shoulder, which supports the handle I, when the churn is not at work.

As butter is often made in small quantities, and the vertical motion of the common churn is extremely fatiguing, we consider those methods of applying the powers of mechanism as valuable improvements. Hence we presume to recommend the preceding improved butter-churns to be generally introduced; for the facility and expedition, with which butter is thus obtained, will amply compensate the additional expense.

WRIGHT'S CHURN. This churn is made in the form of a cube, with vertical dashers, as a, a, a, a, a, a, a, a; B, the top that takes off; C, the handle by which the dashers are turned; D, D, D, D, the form of the churn each way; C, the spindle that goes through the dashers. Churns, agreeably to this form, are made by WRIGHT and Co. of Philadelphia.

CHURNING. As we have already discussed the subject of butter, and treated of the management of the dairy as connected with it, we shall only offer here a few supplementary remarks.

If a pump-churn be employed, it may be plunged a foot deep in a tub of cold water, and remain there during the whole time of churning; which will harden the butter in a considerable degree. This operation, as we have before observed, may be much facilitated,

by pouring into the churn a small quantity of distilled vinegar, which will produce butter in the course of one hour. Those who make use of a pump-churn, should endeavour to keep up a regular motion of the machine; and by no means admit any person to assist them, unless from absolute necessity: for, if the churning be irregularly performed, the butter will in winter *go back;* and if the agitation be more quick and violent in summer, it will cause the butter to ferment, and thus to acquire a very disagreeable flavour. Where there are many cows, a barrel-churn is preferred; but unless it be kept very clean, the bad effects of it will be soon discovered in the butter. Particular care should also be taken to place it, in a proper temperature, according to the change of the season; that is, to fix it in a warmer situation in the winter, and, in the summer to expose it to a free current of air.

[All churns are defective that do not admit the access of the common air, to aid in decomposing the milk. Hence the common churn is upon the whole the most sure.—T. C.]

CHURN-STAFF. See WART-WORT.

CHYLE, in animal economy, is that white fluid, produced from the nutritious part of the food, in the first passages, after the fibrous or feculent matter has been separated: it is chiefly generated in the milk-vessels of the mesentery, whence it passes to the receptacle of the chyle, situated under the left kidney; and is conveyed to what is called the thoracic duct, or the canal of the chest, from which it enters certain veins, where it is mixed with the *blood;* in short, it is the only supply of that *vital* fluid, and hence the great importance of wholesome food, from which alone a salubrious blood can be prepared, will be easily conceived. In this view only, we have introduced the word *chyle:* a liquor which resembles milk; has a sweetish-saline taste; easily coagulates; and consists of a mixture of oily, watery, and lymphatic parts (see LYMPH); its milky colour arises from the combination of oil with water; an instance of which occurs in the milk of almonds.

As the chyle is, by nature, intended to form the blood, to supply the body with nutritious juices for the daily loss and waste it sustains, it is obvious that this salutary process ought not to be interrupted by violent exercise after meals; because the chyle is supposed not to be completely secreted, till about four hours after the food has been taken.

Dr. DARWIN observes that, though the chyle, from different kinds of aliment, is very similar, and all the various constituent parts of animal bodies are ultimately produced from the chyle, by sanguification and secretion, yet it happens, that some kinds of aliment possess a greater quantity of these particles, than others: such materials, for instance, as already contain much sugar, mucilage, and oil, as the flesh of dead animals, or the fruits and seeds of vegetables.

CHYME, in the process of digestion, the food taken into the stomach, is by an increased temperature, by being mixed with the gastric juice, and by the action of the stomach upon it, converted into a soft uniform mass, in which the previous texture, or nature of the aliment can be no longer distinguished. This mass is called chyme, and it passes by the pylorus into the intestinal canal, where it is mixed with the bile. The thinner parts of it are now absorbed by the lacteals, in the form of a white liquor called chyle. This passes through the glands of the mesentery, and is at length conveyed into the blood by the thoracic duct. The principal use of the chyle is to supply the matter from which the blood and other fluids of the body are prepared; from which fluids the solid parts are formed. See ASSIMILATION, BILE.

CINCHONA, or Jesuit's Bark; a genus of low trees, growing to the height of 15 or 20 feet, and natives of Peru. Linnæus describes two species, the white and the coloured; and a third has been found in the West Indies, particularly in Jamaica and St. Lucia. The two latter are used in medicine. It was first introduced for the cure of intermittent fevers: and in these, when properly exhibited, it rarely fails of success. Practitioners, however, have differed with regard to the best mode of exhibition, both as to the time when it should be taken, and the quantity of the dose. The latter, indeed, varies with the case that requires it; and in many vernal intermittents it seems even scarcely necessary. In some instances it is found to disorder the stomach in various ways; under which circumstances, opium and aromatics are severally employed to prevent the specific inconvenience experienced: but these additions should never be used except where necessity demands them.

[CINNABAR, in natural history, is either native, or factitious The former is an ore of quicksilver, moderately compact, very heavy, and of a beautiful striated, red colour. The latter is composed of six parts of mercury to one of sulphur. The sulphur is first melted, and the mercury previously made hot in an iron vessel, is gradually stirred into the melted sulphur. It is then sublimed in glass vessels placed in a sand bath; when finely ground and washed it is the powder called *vermillion*. It is only used as a pigment, not as a medicine.—T. C.]

CINNAMON, is the bark of the true cinnamon tree, or *Laurus cinnamomum*, L.; but an inferior sort, which is often sold for genuine, is collected from the base cinnamon, or *Laurus Cassia*, L. See BAY-TREE.

Cinnamon is one of the most agreeable, and useful aromatics: it is more grateful both to the palate and stomach, than the generality of spices.

CIRCLE, in geometry, a plane figure bounded by a curve line which returns into itself, called its circumference, and which is every where equally distant from a point within, called its centre. The circumference or periphery itself is called the circle, though improperly, as that name denotes the space contained within the circumference A circle is described with a pair of compasses, fixing one foot in the centre, and turning the other round to trace out the circumference. The circumference of every circle is supposed to be divided into 360 equal parts, called degrees and marked °; each degree in 60 minutes or primes, marked ′, and so on So 24°, 12′, 15″, 20‴, is 24 degrees, 12 minutes, 15 seconds, 20 thirds. Circles have many curious properties, some of the most important of which are these:

1. The circle is the most capacious of all plain figures, or contains the greatest area within the same perimeter, or has the least perimeter about the same area; being the limit and last of all regular polygons, having the number of its sides infinite.

2 The area of a circle is always less than the area of any regular polygon circumscribed about it, and its circumference always less than the perimeter of the polygon. But on the other hand, its area is always greater than that of its inscribed polygon, and its circumference greater than the perimeter of the said inscribed polygon. However, the area and perimeter of the circle approach always nearer and nearer to those of the two polygons, as the number of the sides of these is greater: the circle being always limited between the two polygons.

3. The area of a circle is equal to that of a triangle whose base is equal to the circumference, and perpendicular equal to the radius. And therefore the area of the circle is found by multiplying half the circumference into half the diameter, or the whole circumference into the whole diameter, and taking the fourth part of the product.

4. Circles, like other similar plane figures, are to one another, as the squares of their diameters And the area of the circle is to the square of the diameter, as 11 to 14 nearly, as proved by Archimedes, or as ·7884 to one more nearly.

5. The circumferences of circles are to one another, as their diameters or radii. And as the areas of circles are proportional to the rectangles of their radii and circumferences; therefore the quadrature of the circle will be effected by the rectification of its circumferences, that is, if the true length of the circumference could be found the true area could be found also.

CIRCLES Druidical, in British topography, a name given to certain ancient inclosures formed by rude stones circularly arranged.

These, it is now generally agreed, were temples, and many writers think also places of solemn assemblies for councils or elections, and seats of judgment These temples, though generally circular, occasionally differ as well in figure as magnitude: with relation to the first, the most simple were composed of one circle. Stonehenge consisted of two circles and two ovals respectively concentric: whilst that at Bottalch near St Just in Cornwall is formed by four intersecting circles.

The great temple at Abury in Wiltshire, it is said, described the figure of a seraph or fiery flying serpent represented by circles and right lines. Some, besides circles, have avenues of stone pillars Most if not all of them have pillars or altars within their penetralia or centre. In the article of magnitude and number of stones, there is the greatest variety, some circles being only 12 feet diameter and formed only of 12 stones; whilst others, such as Stonehenge and Abury, contained the first 149, the second 652, and occupied many acres of ground. All these dif-

ferent numbers, measures, and arrangements, had their pretended reference, either to the astronomical divisions of the year, or some mysteries of the Druidical religion.

CIRCULATION *of the blood* is performed in the following manner: the blood is returned to the right auricle of the heart, by the descending and ascending venæ cavæ, which, when distended, contracts and sends its blood into the right ventricle; from the right ventricle it is propelled through the pulmonary artery, to circulate through, and undergo a change in the lungs, being prevented from returning into the right auricle by the closing of the valves, which are situated for that purpose. Having undergone this change in the lungs, it is brought to the left auricle of the heart by the four pulmonary veins, and thence is evacuated into the left ventricle. The left ventricle when distended contracts, and throws the blood through the aorta to every part of the body, by the arteries, to be returned by the veins into the venæ cavæ. It is prevented from passing back from the left ventricle into the auricle by a valvular apparatus; and the beginning of the pulmonary artery and aorta is also furnished with similar organs to prevent its returning into the ventricles.

CIRCUMFERENTOR, a mathematical instrument used by land surveyors for taking angles by the magnetic needle. It is an instrument (where great accuracy is not desired) much used in surveying in and about woodlands, commons, harbours, sea coasts, in the working of coal mines, &c &c.

Where a permanent direction of the needle is of the most material consequence in surveying, the instrument is made of brass, and in its most simple state consists of the following parts, a brass index and circle all of a piece. The index is commonly about 14 inches long, and an inch and a half broad, the diameter of the circle about seven inches. On this is made a chart whose meridian line answers to the middle of the breadth of the index, and is divided into 360 degrees. There is a brass ring soldered on the circumference of the circle, on which screws another ring, with a flat glass in it, so as to form a kind of box for the needle, suspended on the pivot in the centre of the circle There are also two sights to screw on and slide up and down the index, as also a spangle and socket screw on the back of the circle for putting the head of the staff in.

CISTERNS are vessels employed for the reception of rain, or other water, either under ground, such as those of navigable canals, &c. or above ground, for domestic and other purposes. In this place we shall treat only of the latter. In London the cisterns are of lead.

As the water collected in leaden cisterns is apt to corrupt, either by stagnating for several days, when the pipes happen to be obstructed, or by the deposition of feculent matter, as well as the incrustation formed in such vessels, it follows that they ought to be frequently cleansed of the copious sediment they contain. This attention is the more necessary, as *lead* is a metal liable to be dissolved by acids; and, in that state, proves a slow, but fatal poison. Although the acidity contained in stagnant water, which has, in its course, been impregnated with animal and vegetable particles, cannot be very considerable, yet it will be more safe, and prudent, to prevent the formation of such acids, by an early attention to the purity of the water.

The deeper cisterns are, the better the water will be kept. Where the ground is not so bad as to require a round form, a cube is a good figure: a double cube must be better, as it gains depth and consequently coolness. A cistern of 6 cubic feet, holds 16 hogsheads of 100 gallons each, or 26 hogsheads. A double cube of 5 feet would hold above 18 rum hogsheads of 100 gallons. The pit should be dug exactly by square and plumb. On the face of the pit, lay potters-clay, plasterwise, with a trowel, coat over coat (as it dries and cracks) two or three inches in all. Against this firm even face of plaister raise the brick or stone work. Bed the bottom, three or four inches thick with strong clay, beat to a smooth, even surface. Moisten the clay, and beat it with switches, or small hoop poles, but with nothing heavy. On this clay-floor, lay a double bed of brick; and, on the margin of this, carry up the side walls half brick thick, laying them in terras. Cover the cistern over, but leave room to fix a small pump, which must be two feet from the bottom: or a roller and bucket may be used to raise the water.

The above directions are taken from Mr. BORDLEY's Essays, and will answer where lime cannot be had to make Mr. H[illegible]'s cement, before noted. In ma-

ny places of Europe, rain-water saved in cisterns is the only water drank. STOLBERG says, he drank some in the vicinity of Naples, near three years old, and found it excellent. Mr. BENTHAM has lately taught us, that water may be kept during the above period perfectly sweet. On the flat coasts of the United States, these rain water cisterns ought to be generally built: for the water from the ground is very bad, and occasions many of the disorders attributed to other causes.

[The mortar or plaister for cisterns, should be made of lime *well and recently* burnt, with the admixture of one fourth of terras, ochre, ground iron ore, or smithey slack, (the dust of a blacksmith's shop.)—T. C]

Anciently there were cisterns all over the country of Palestine. There were some likewise in cities and private houses. As the cities for the most part were built in mountains, and the rains fell regularly in Judea at two seasons of the year only, in spring and autumn, people were obliged to keep water in their cisterns in the country for the use of their cattle, and in cities for the convenience of the inhabitants. There are still cisterns of very large dimensions to be seen in Palestine, some whereof are 150 paces long and 54 wide. There is one to be seen at Ramah of 32 paces in length and 28 in breadth. Wells and cisterns, springs and fountains, are generally confounded in Scripture language.

CITRIC ACID, is found in the juice of lemons, and limes, and is that which gives it the sour taste. This acid by chemical preparation may be converted inso crystals, and in that state it can be kept any length of time. A very pleasant drink is made by dissolving 40 grains of the crystallised citric acid in a pint of water, and then sweetening it with a small quantity of sugar.

CITRON, or *Citrus*, L. an exotic genus of plants, comprising six species: of which the following are occasionally reared in hot-houses.

1. The *Medica*, or Citron-tree, which is a beautiful evergreen, rises from five to ten feet in height, and forms a full head, thickly set with leaves. It is very luxuriant in its vegetation, shooting forth a profusion of sweet flowers in the spring, and early in the summer, which are frequently succeeded by an abundance of fruit, that arrives, sometimes, at tolerable perfection.

This species is originally obtained by seed; but the most certain method of propagating it, is by *budding* it on stocks raised from seeds to a proper size. These may be sown, in March, in pots of rich light earth, half an inch deep, and plunged in a hot-bed under frames and glasses, being occasionally watered. Towards the middle of June, they may be exposed to the open air, in which they should remain till October, when they are to be removed to the green-house till the ensuing spring. In the month of March, or April, following, they will be fit to be transplanted, singly, in small pots, care being taken to water them immediately after that operation is performed, and to repeat it when necessary; so that in the course of a year, or two, the largest of those designed for stocks will be fit for budding. Previously to their being planted, they must be set for a day or two in tubs of water, to *plump* their bark and roots. Next, they should be washed and cleaned, the roots freed from diseased parts and all the small dried fibres. They are then to be planted in pots filled with light earth, and plunged in a tan-bed, where they should remain for three or four months; after which they may be exposed to the open air, but will bear it only from the end of May to the middle of October.

The fruit of the citron-tree yields a very agreeable acid, which is of considerable utility in medicine, particularly as an antiscorbutic. See LEMON-JUICE.

There is another variety of this species, growing abundantly in the British West India Islands, producing a spherical fruit of a much smaller size than the lemon, and containing an acid juice, in a more concentrated state. See LIMES.

2. The *Aurantium*. See ORANGE.

3. The *Decumana*, or the Giant Citron, which is common in the East and West Indies, and produces a fruit, sometimes 14 lbs. in weight, containing a sweet pulp, and small compartments in the centre, which abound with a sub-acid vinous juice. As it requires nearly two years to arrive at maturity, in the climate of Europe, it is seldom cultivated.

CITY, a large corporate town. Forming our ideas from what we commonly behold, we imagine that a city must necessarily be a close-built and confined plot of ground, with narrow paved ways, and a total exclusion of the face of nature; but these characteristics

have originated in peculiar circumstances. Before the Roman invasion of Britain, its cities, and, among others, that of London, were extensive districts, begirt with woods or slight ramparts of earth, in which dwellings were scattered at some distance from each other. War having rendered it requisite that cities should be defensible posts, the smallness of the space they occupied became a consideration of importance. Their inhabitants were taught to crowd themselves together as much as possible; and among the expedients resorted to was that of building apartments over one another; thereby multiplying the number of dwellings without increasing the superficial magnitude of the place. Trade, too, by requiring a multitude of persons upon one spot, has always been the foundation of what we now call cities. Cities usually possess, by charter, a variety of peculiar privileges; and these charters, though they now sometimes appear to be the supporters of a narrow policy, were, in their institution, grants of freedom then no where else possessed. These were the first dawnings of liberty; by these the spell that maintained the feudal tyranny was broken. *City* and *burg* were formerly synonymous words.

CLARIFICATION, is the art of clearing or fining liquids from heterogeneous or feculent ingredients. For this purpose, the whites of eggs, milk, blood, and isinglass, are usually employed. [The three first for wine and cyder; blood for sugar by the sugar refiners; isinglass by brewers, with sand, for beer.—T. C.]

The following observations are abridged from a long paper by PARMENTIER, *in "Annales de Chimie"*

The most simple method of clarifying liquids is, by repose: but this method is tedious, and tends to the formation of new products, which by changing the composition of the fluid itself, no longer presents it, independent of the abstraction of the bodies which affected its clearness, the same as it was before its clarification. Thus, the juice of lemons, gooseberries, &c. when examined before or after their spontaneous clarification, are so different in their taste, colour, and their domestic utility.

The effects here stated take place only with respect to such liquids as are fermentable. Other fluids, as water, alcohol, æther, oil, &c. are well adapted to this treatment.

The second proof of clarification is by *filtration*. The instruments of this process are various. For water, viscous, alcoholic, or oily fluids, paper may be used: and such must be chosen as has its pores of a requisite magnitude to admit the fluid intended to be filtered, without suffering any of the particles which produced the turbidness to pass through. For syrups, woollen cloths are used; the operator fixes his cloth in a square frame, fastening the four corners upon pins disposed for that purpose. The boiling syrup is poured in the middle, where it always forms a kind of concavity, and the liquid passes very clear.

Essential oils are filtered by introducing carded cotton into the tube of a glass funnel, where it is lightly pressed together with a glass rod, so as to form a kind of stopper: after which the fluid to be filtered is poured into the funnel.

Concentrated acids, can only be filtered through pounded glass, which must be washed several times before using; first in a larger quantity of water, and afterwards in an acid, in order to deprive it of the earthy substance which the acids might dissolve. Sand is also commonly employed to clarify water for domestic uses: it must, however, be changed frequently.

Filtering stones are bad instruments to procure good water; for the filtration is made slowly, and very often stops altogether, if the inner and exterior surfaces of the stone be not rubbed from time to time with a coarse brush, to detach the earth which the water deposits.

The whites of eggs, the acids, certain salts, lime, blood, and alcohol, may, in many cases, concur to operate the clarification of certain fluids. Experience determines the preference given to one rather than another.

Most syrups are clarified by heating them, after having mixed the whites of eggs with them; the clarification is effected at the instant the mixture begins to boil. It has also been observed that the white of eggs alone is not sufficient to clarify liquids, even though they be heated sufficient to cause them to boil, but that it is necessary to assist its action by means of an acid, or salt with excess of acid In proof of this, the clarification of whey, may be offered as an example. Whey, in which the white of eggs have been mixed, does not admit of the coagulation which

carries the cheesy matter along with it, unless a portion of acidulous tartarite of potash or vinegar be added at the instant the boiling begins.

Most of the juices of plants newly expressed, may be partly clarified by heat. This method may be recurred to, when the viscidity and density of the juices, prevent a filtration.

[Wine is better clarified with skimmed milk than with eggs. Milk decomposes the tartareous acid and combines with it; eggs do not. Half a pint to a quarter cask. For beer, dissolve isinglass in beer by boiling; mix in it a little clean sand. To purify muddy water, put a teaspoonful of solution of alum to a quart of water, and let it subside gradually.—T C]

CLARION, a kind of trumpet, the tube of which is peculiarly narrow, and the tone acute and shrill.

CLARO OBSCURO, (Latin), *chiaro oscuro* (Italian) and *clair-obscur* (French), a phrase in painting, signifying light and shade In pictural criticism, it means the relief that is produced by light and shade, independently of colour. In the art itself, it denotes that species of painting or design, in which no attempt is made to give colours to the objects represented, and where, consequently, light and shade are every thing.

CLASS, an appellation given to the most general subdivisions of any thing. Thus in the Linnæan system of natural history, the animal creation is divided into six classes, viz. Mammalia, Aves, Amphibia, Pisces, Insecta, et Vermes

CLASS, in Botany, denotes the primary division of plants into large groups, each of which is to be subdivided by a regular downward progression, into orders, genera and species, with occasional intermediate subdivisions, all subordinate to the division which stands immediately above them. So that the classes have been compared to the first layer of a truncated pyramid, which increases gradually as it receives the orders, general and occasional intermediate subdivisions, till at length it terminates in an immense base, consisting entirely of species

CLAY, *Alumina*, is a simple earth, compact, heavy, stiff, viscid, and ductile, when moist, which is easily mixed with water, and does not readily subside. [It is the basis of the salt called alum, and is extensively used, as the basis also of the porcelain manufactory, in dying, for making crucibles, and vessels for the glass manufactory.—T. C.]

Clay is a mixture of alumine and silex, and is too well known to require much description.

It is opaque, has an earthy texture, is about twice as heavy as water, when moistened is very ductile, adheres slightly to the tongue, and its peculiar smell (called clayey) every one is acquainted with.

Common Clay, or *Potter's Clay*, which is found in nearly every country of the world, is sometimes white, has a blue or yellowish tinge, or is brown or reddish.

It is the peculiar quality of this substance to become so hard by heat that it will often strike fire with steel. The ductility of clay, and its property of thus hardening in the fire, have rendered it an article of indispensable utility to mankind in all civilised countries. It is formed into eating vessels of almost every description; plates, dishes, cups, basins, bowls, and pans for keeping provisions in. The coarser kinds are manufactured into bricks for the building of houses, and tiles for the covering and paving of them. For the formation of the above almost any kind of clay may be advantageously used; but it is necessary to mix it with sand, for the purpose of rendering the vessels which are made of it more firm and strong. Those that are applied to culinary, and other uses in which it is requisite for them not to be penetrable by water, are covered with a glazing. This, for coarse ware, is frequently made either with lead, or by throwing a certain portion of salt into the furnace. In the formation of the better kinds of earthen-ware, the clay is made into a paste with water, moulded into the requisite shape upon an horizontal wheel, the inside being formed by one hand of the potter, and the outside by the other, as the wheel turns round. When the pieces have been baked, they are dipped into a glazing mixture, consisting of white lead, ground flints, and water, and are exposed a second time to the fire. The different colours of earthen-ware are obtained by means of various kinds of metallic oxides.

Bricks and tiles are formed in moulds of the requisite shape, afterwards dried for some time in the sun, and finally piled in kilns and baked, to a proper degree of hardness. The earth for bricks ought to be sufficiently fine, free from pebbles, and not too sandy, which would render them heavy and

brittle; nor ought it to be entirely free from sand, since this would make them crack in drying.

Clay is a substance of inestimable value for forming the bottoms of ponds, and the bottoms and sides of canals and reservoirs, to prevent the water from draining away, as in many cases it otherwise would do. It also composes, in a great measure, those tenacious earths called arable soils. What is peculiarly denominated clay-land is known by its holding water, and not soon drying when wetted. Such land requires much labour from the husbandman, before it can be sufficiently pulverised, or brought to a fit state for being productive of corn or grass.

[The best manure for clay-soil, is sand and ashes, or sand and lime; also plough deep, and expose it in the autumn in ridges, throughout the frost of winter, as the brick-makers are accustomed to do.—T. C.]

Porcelain Clay is generally of white or reddish white colour, sometimes inclining to yellowish or grey. When dry, it absorbs moisture rapidly; and it becoms very tenacious when kneaded.

The usual distinction betwixt earthenware and porcelain is, that the former is opaque, and the latter semitransparent. In the manufacture of porcelain the clay is sometimes used alone, and sometimes intermixed with other earths, or with felspar. The earliest manufacture of porcelain is supposed to have been that in China and Japan. The quantity produced in China must formerly have been great beyond all conception, since not only a considerable portion of the eastern parts of the world, but almost the whole of Europe, was supplied with it. In a single province it is said that nearly a million of persons were at one time employed in this manufacture.

The manufactory at Seves, in France, has long been celebrated both for the excellence and elegance of its porcelain. There are well known manufactories at Meissen, in Saxony, at Berlin, and in Austria; but none of these are, at present superior to the English, in Worcestershire and Staffordshire.

Pipe Clay is of a very plastic nature, and yellowish white colour. In a strong heat it is hardened, and rendered perpectly white.

It is of this clay that tobacco pipes are made, by the simple process of casting them in moulds, forming a hole through the stems by means of a wire, generally dipping the small end into some glazing material, and then baking them. Pipe-clay is also formed into oblong pieces, dried, and employed for cleaning white woollen cloths, and for various purposes of domestic utility.

Tripoli is a kind of clay of yellowish grey, brown, or white colour, sometimes striped, or spotted, and of an earthy texture.

It feels harsh and dry to the touch, scarcely adheres to the tongue, and will not take a polish from the nail.

This substance obtained its name from having formerly been imported into Europe from Tripoli, on the north coast of Africa. It is, however, now found in several parts of Germany, and a granulated kind has been discovered in England.

By lapidaries and other artists tripoli is used for the polishing of precious stones, metals, and glass for optical instruments; and its particles are so fine as not to leave any perceptible scratches whatever on their surface.

Rotten Stone is a variety of tripoli, found in Derbyshire, which is used for most of the same purposes.

CLEF, or *cliff*, derived, through the French, from the Latin *clavis*, "a key," a character in music, placed in the beginning of a stave, to determine the degree of elevation occupied by that stave, in the general claviary or system, and to point out the names of the notes which it contains in the line of that clef. By it is expressed the fundamental sound in the diatonic scale, which requires a determined succession of tones or semi-tones, whether major or minor, peculiar to the note from which we set out; and hence, opening, as it were, a way to this succession, the technical term *key* is used with great propriety.

CLEPSYDRA, a water clock, or an instrument to measure time by the fall of a certain quantity of water. There were many kinds of clepsydræ among the ancients, but they all had this in common, that the water ran generally through a narrow passage, from one vessel to another, and in the lower vessel, was a piece of cork or light wood, which as the vessel filled, rose up by degrees, and showed the hour.

CLERGY, a general name given to the body of ecclesiastics of the Christian church, of whatever denomination.

CLERGY, *Benefit of*, under the article Benefit of *Clergy*, is said to have

meant "benefit of *learning*." Other authorities appear to justify a different explanation, which shall be given in this place. It is true that in the old English writers, a *clerk* signifies a *literate man*; but it is evident that he who could write and read was called a clerk because in this respect, he resembled an ecclesiastic, rather than that an ecclesiastic was so called because he could write and read: the word *clerk* being derived from the Greek *cleros*, a name always appropriated to the priesthood, because synonymous to that given to the tribe of Levi, and signifying a *lot* or *heritage*, by which expression was intended the service of God; a duty that in the tribe of Levi, was a *lot* or *heritage*. With respect to the benefit of clergy, it appears that it was actually a benefit of the ecclesiastical profession; but that from the loose terms, or vague idea, of the law, to be attributed perhaps to the little notion entertained that any other persons than ecclesiastics would ever be able to write and read, it was at one time abusively held that all who possessed these accomplishments were entitled to the advantage.—But what was the original benefit proposed? That priesthood, or clergy, might be pleaded in bar to the jurisdiction of a secular court. Setting out from this point, the history of the subject is really curious. In the reign of Henry VI. when the privilege was first regularly established, it was directed that the prisoner should submit to be arraigned, and then, either immediately, or after the trial, plead the benefit of his clergy in the way of arrest of judgment. By a statute of 4 Henry VII. c. xiii. the distinction always intended was revived, and mere scholars were separated from those in holy orders. The former, however, retained a part of the immunity; but they were to be burned with a hot iron on the brawn of the thumb, and not allowed *their clergy* more than once. Under the reign of Elizabeth, it was enacted that a clerk, after pleading his privilege, should not be resigned to the ecclesiastical authority, as formerly (a practice which had been found pregnant with the most scandalous abuses), but confined, at the discretion of the judge, for any term not exceeding one year. Under Mary, James I. and William and Mary, the original design of the provision was entirely lost. Certain small crimes were said to be within the benefit of clergy, and were punished accordingly, though the prisoners, if women, were not required to read. All women, and all male commoners who could read, were punished in this manner; and clerks, in orders, though they might be imprisoned, could not be burnt on the thumb. This latter is easily accounted for: the clerk could, as he still can, claim the benefit of his clergy again and again; but the women and laymen were allowed the privilege but once: the burning on the thumb was a mark by which the offender might be known, after having once pleaded his clergy; and as the clerk might always plead it, this precaution, in his case, would have been useless. When, in a more enlightened age, it was perceived that the knowledge of the offender did but increase his guilt; and that if the punishment of death for a simple felony were too severe for those who had been liberally instructed, it was still more so for the ignorant, a statute, 5 Ann, c. 6. enacted that the benefit of clergy should be granted to all, the nature of whose offences entitle them to ask it, without requiring any proof that they can read. In this state the *benefit of clergy* stands at present; with the exception, that the court, in its discretion, may substitute transportation for seven years, for burning in the hand and imprisonment. The clergy, as exempted from burning in the hand, and the imprisonment with hard labour, are also exempted from transportation. The privilege of peerage is in all respects similar to the benefit of clergy.

CLERK, *Clericus*, a word originally used to denote a learned man, a man of letters: whence the term is appropriated to churchmen.

CLIMACTERIC, among physicians and astrologers, a critical year in a person's life. According to some this is every seventh year, but others allow only those years produced by multiplying 7 by the odd number 3, 5, 7, 9, to be climacteral. These years they say bring with them some remarkable change with respect to health, life or fortune; the grand climacteric is the 63d year, but some making two add to this the 81st: the other remarkable climacterics are the 7th, 21st, 35th, 49th, and 56th.

CLIMATE, or *clime*, in geography, a division of the surface of the globe, parallel to the equator, of such a breadth as that the longest day in the parallel nearer the pole exceeds the longest day in that next the equator by

a certain space of time; as, half an hour. The *beginning* of the climate is a parallel circle wherein the day is shortest; the *end* of the climate, that wherein the day is longest. There are several climates in one zone. As the climates commence from the equator, the first climate at its beginning has its longest day precisely twelve hours long, and at its end, twelve hours and a half. The rest proceed in the same manner, as far as the polar circles, where the *hour*-climates are said to terminate, and the *month*-climates to commence. The *month* climate is a space terminated between two circles parallel to the polar circles, whose longest daylight is longer or shorter than that of its adjoining one by thirty days. In common speech, the term climate is applied to a peculiar state of the atmosphere; and the different parts of the world are spoken of as different climates, not on account of the length of the days, but of the heat of the atmosphere, and other natural circumstances. In this sense, the peculiarities of climates are of infinite importance in the economy of nature. On these, all the productions of the earth are dependent. Even man, who is justly said to be the creature of all climates, indures only by yielding to their influence. This influence has been too much controverted by Helvetius, and perhaps Montesquieu has allowed it too much importance: neither the one nor the other drew his observations from those quarters where most information is to be had, among men still living in a state comparatively wild. In countries where life may be maintained almost without exertion, and every pleasure of the senses is lavished, man is, and must be, a very different being from the native of a less bountiful soil and less indulgent climate, whose subsistence can only be obtained by a constant stretch of his faculties. We are accustomed to call the people of fruitful countries supine, and they term us restless. They sit still, because their wants are supplied; we roam from one end of the world to the other, because ours are craving.

In a work chiefly of a *domestic* nature, a philosophical digression into the various causes which influence the climate of countries in general, and of the United States in particular, cannot be expected. It may, however, be useful to state a few facts on the subject, from Mr. KIRWAN's treatise, entitled "An Estimate of the temperature of different latitudes."

1. Elevation diminishes the mean temperature of places. If this elevation be moderate, or at the rate of six feet per mile from the nearest sea, then for every 200 feet of elevation, allow $\frac{1}{2}$ of a degree for the diminution of the mean annual temperature.

2. Next to elevation, distance from the standard ocean seems to have the most considerable effect upon the mean annual temperature. Mr K. attributes the effect of distance from the standard ocean, to the unequal capacities of land and water for heat; but Mr. DALTON, of Manchester, observes, that this alone appears inadequate to the effect, and he concludes, after some ingenious reasoning, that *in the temperate zones, the western coasts of all continents and large islands, will have a higher mean temperature than the eastern coasts under the same parallel; and, particularly, will have more moderate winters.*

3. All countries lying to the windward of high mountains, and extensive forests, are warmer than those lying to the leeward, in the same latitude.

Countries that lie southward of any sea, are warmer than those that have that sea to the south of them. Islands participate most of the temperature of the sea, and are therefore not subject to the extremes of heat and cold so much as continents.

The temperatures of different years, differ very little near the equator, but they differ more and more as the latitudes approach the poles.

The climate of Pennsylvania, east of the Alleghany mountains, has unquestionably become much milder in the course of the last forty years, owing to the earth being gradually more and more exposed to the heat of the sun from extended cultivation.

Those of our readers, who wish to acquire additional information on this subject, we refer to Dr. W FALCONER's elaborate "*Remarks on the influence of Climate, Situation, Nature of Country, Population, Nature of Food, Way of Life: on the Dispositions and Temper, Manners, and Behaviour, Intellects, Laws, and Customs, Forms of Government, and Religion of Mankind,*" in which this interesting topic is minutely and ingeniously discussed.

CLOCK, a machine for measuring time, called, when first invented, a nocturnal dial, to distinguish it from the sun-dial. On the credit of an epitaph recorded by Pavinius, some have attributed this invention to Pacificus, who lived in the time of Lotharius, son of Lewis the *Débonnaire*. Others as-

cribe it to Boethius, about the year 510. Clocks, like those now used, were either first invented, or at least revived somewhat more than two centuries ago. The contrivance of pendulum-clocks took place about the middle of the seventeenth century, either in Italy or in Holland. The first made in England was by a Dutchman, in the year 1662 See HOROLOGY.

CLOSE-STOOL, a chamber implement of considerable utility to patients and invalids: though it has lately been in a great measure superseded, in London, by the invention of *water-closets.*

CLOTH, in commerce, a manufacture made of wool, cotton, flax, hemp, &c. woven in a loom. In this place, however, we shall treat only of woollen cloths: these are of various qualities, fine or coarse, which depend on a variety of circumstances.

The best wools for manufacturing of cloths of that kind are those of England and Spain; and of these, those of Lincolnshire in the one, and Segovia in the other, are preferred. To use wool to the best advantage, it must be scoured, by putting it into a liquor somewhat more than warm, and when it has continued long enough to dissolve the grease, draining it, and washing it thoroughly in running water. When it feels dry, and has no smell but that natural to the sheep, it is said to be sufficiently scoured After this, it is hung to dry; this is done in the shade, the heat of the sun making it harsh and inflexible When dry, it is beat with rods, on hurdles of wood, or on cords, to cleanse it from dust and the grosser filth. The more it is thus beat and cleansed, the softer it becomes, and the more adapted to spinning After beating, it must be well picked, to free it from the filth that has escaped the rods.—It is now in a proper condition to be oiled, and carded on large iron cards placed slopewise; and this done, it is given to the spinners, who first card it on the knee, on small cards, and then spin it on the wheel, observing to make the thread of the warp smaller by one third than that of the woof, and much more compactly twisted. The thread thus spun, is reeled, and made into skeins: that designed for the woof is wound on little tubes, pieces of paper, or rushes, so disposed as that they may be easily put in the eye of the shuttle; that for the warp is wound on a kind of large wooden bobbin, to dispose it for warping. When warped, it is stiffened with size; and when again dry, is given to the weaver, who mounts it on the loom. The warp thus mounted, the weavers, of whom each loom has two, one on each side, tread alternately on the treadle, first on the right step and then on the left, which raises and lowers the thread of the warp equally; and between it they throw the shuttle transversely, from one to the other. Every time that the shuttle is thus thrown, and a thread of the woof inserted within the warp, they strike it conjunctly with the same frame wherein is fastened the comb or reed, between the teeth of which the threads of the warp are passed, repeating the stroke as often as is necessary. The weavers having continued their work till the whole warp is filled with woof, the business of the loom is finished. The cloth is then taken off, by unrolling it from the beam whereon it had been wound as it was wove, and given to be freed from knots, ends of threads, straws, and other irregularities; which is done with iron nippers. In this condition it is carried to the fullery to be scoured The cloth, being again cleansed of the matter with which it is fulled, is returned to the former hands, to have the lesser impurities, &c. taken off as before, and then re-delivered to the fuller, to be beat and fulled with hot water, wherein a proper quantity of soap has been dissolved. After fulling, it is taken out to be smoothed or pulled by the lists, lengthwise, to take out the wrinkles, &c. The smoothing is repeated every two hours, till the fulling be finished, and the cloth brought to its proper breadth: after which it is washed in clear water, to purge it of the soap, and given wet to the carders to raise the hair or nap on the right side with the thistle. After this preparation, the clothworker takes the cloth, and gives it its first cut or shearing; then, the carders resume it, and after wetting, give it as many more courses with the teazle (*dipsacus fullonum,* common on the river banks of Pennsylvania) as the quality of the stuff requires, always observing to begin against the grain of the hair, and to end with it; as also to begin with a smoother thistle, proceeding still with one sharper and sharper, as far as the 6th degree. After these operations, the cloth, being dried, is returned to the clothworker, who sheers it a second time, and returns it to the carders, who repeat their operation as before, till the nap be well ranged on the surface of cloth, from one end of the piece to the

-ther. The cloth thus wove, scoured, napped, and shorn, is sent to the dyer. When dyed, it is washed in pure water, and the worker with his brush spreads it on a table while wet, and hangs it on the tenters, where it is stretched both in length and breadth, sufficiently to smooth it, set it square, and bring it to its proper dimensions, without straining it too much, observing to brush it afresh, while a little moist, the way of the nap. When quite dry, it is taken off the tenters, and brushed again on the table, to finish the laying of the nap; after which it is folded, and laid under a press, to make it perfectly [illegible] and even, and give it a gloss, being taken from the press it is in a condition for use.—Cloths of mixed colours are wove with wools previously dyed. In the islands of the South-sea, cloth is made from tree-bark.

Woollen cloths being liable to be stained, or soiled, by a variety of accidents, different methods have been contrived to remove such spots, and thus restore the cloth to its former beauty. When stained with grease, fullers' earth, pure pot-ash, or other absorbents, will produce the desired effect. Spots of ink, or other stains, may be taken out by the acid of sorrel, or the oxalic acid (essential salt of lemons,) and the colour restored by alkalies.

The following is the Chinese method of rendering cloth water-proof.—To one ounce of white wax, melted, add one quart of spirit of turpentine, which, when thoroughly mixed and cold, dip the cloth in and hang it up to dry. This is the Chinese method; muslin as well as the strongest cloths, will be rendered impenetrable to rains, without the pores being filled up, or any injury done when the cloth is coloured. Hats are rendered water-proof by means of gum lac, or sandarach dissolved in spirit of wine.

CLOUD, a collection of vapours, consisting of particles of earth, water, and other substances, which the heat of the sun, and the action of terrestrial bodies cause to rise above the face of the globe, to the height, as some have supposed, of a mile or two. Clouds are of various kinds according to the prevalence of any one of these component parts, and particularly according to the quantity of electric fluid they contain. When clouds assume strange and whimsical shapes, varying almost every moment, and small ones meet each other in the air, and vanish upon contact, thunder is thought to be at hand. The vanishing, or dissipating, upon contact, is accounted for on the hypothesis, that two clouds, electrified, the one positively and the other negatively, in meeting, part with their electricity, and thus destroy each other. The uses of clouds are evident. From them proceeds the rain which refreshes the earth; and without which its whole surface must be one desert. Clouds are likewise screens interposed between the earth and the scorching rays of the sun, which are often so powerful as to destroy the more tender vegetables. In the less discoverable operations of nature where the electric fluid is concerned, clouds have a principal share; and, particularly, serve as a medium for conveying that subtile matter from the atmosphere to the earth, and from the earth into the atmosphere. See METEOROLOGY.

CLOVER, a species of trefoil, or *Trifolium*, L. a genus of plants comprising 55 species, of which only 16 are indigenous in England: of these the following are the principal.

1. The *pratense*, or common red clover, which is frequently found in meadows and pastures. This species thrives best on a firm heavy soil, and is raised from seed, which is usually sown between the months of February and April, in the proportion of ten or fifteen pounds per acre. If it be often sown on the same land, the crop will fail; it should therefore be changed for trefoil or lucerne.

Common red clover is usually sown together with wheat, in the spring, as well as with barley and oats, but experienced farmers generally prefer wheat; as, in dry seasons, the clover frequently overpowers the oats or barley; and, if it be sown late, in order to obviate this evil, it often fails, and the crop is lost for that season. It is also mixed with rye-grass, and, if mown when the latter is beginning to flower, the lower growth is considerably increased, and a great quantity of excellent grass is obtained. Another advantage arises from this expedient; for, however severe the frost may be, the clover will be completely screened from its piercing effects by the rye-grass.

The common clover is in flower from May to September, and produces seeds which are known to be ripe by the stalks and heads changing their colour. Cattle, sheep, and pigs are exceedingly fond of this species, and frequently eat of it so eagerly as to become *hoven* or *blown*. That disorder,

however, may be prevented by constantly moving them about the field, when turned in, so that the first ball may sink into their maw before the next be deposited. Or, if cattle be turned into clover belly-deep, they will, it is said, receive no injury by eating too freely of it; as it is pernicious only in its earlier state. Should they, nevertheless, be attacked with that dangerous swelling, they may be relieved by adopting the remedies pointed out under the article CATTLE.

It deserves to be noticed, that the introduction of this beneficial plant into modern husbandry, has been attended with numerous and important advantages. Since that period, the new system of stall-feeding dates its origin. Many insignificant farms, on the Continent of Europe, have since been converted into valuable estates; for, as this species of clover is annually productive of three or four crops, for two years at least, it is generally ploughed in, after the last mowing, in autumn, and wheat or rye, immediately sown on the land, without any other manure, except what is derived from the fertilising roots of that vegetable. Sometimes, however, gypsum is scattered on such fields during winter: in Pennsylvania, this operation is generally performed during the months of March or April.

In Sweden, the heads are employed for dyeing wool of a green colour; and if mixed with alum, they yield a light, if with copperas, a dark green colour.

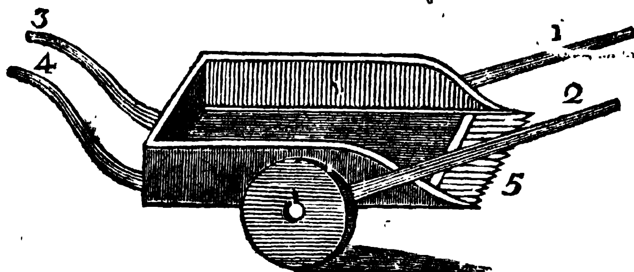
2. The *medium*, or red perennial clover, which is found in pastures, hedges, and on the sides of woods. It thrives on a rich soil, whether clay or gravel, and will even grow upon a moor, if properly cultivated. It grows spontaneously on marl-land; but is usually reared from seed, which should be put in the ground from the middle of April to the middle of May. This species, as well as the common clover, is frequently sown together with flax, on a soil highly cultivated for that purpose; and, as the latter is a forward plant, it is generally removed so early as to allow the clover time for growing. Red clover is sometimes sown by itself; [illegible] practice is by no means to be recommended; for the crop is liable to be lost, unless it be sheltered in its infant state, during the severity of the winter, or from a hot sun. When red clover is intended for seed, the ground ought to be carefully cleared of weeds, that the seed may be preserved pure. It is collected both from the first and second crop, but principally from the former. When one half of the field has changed its colour, by the drying of the *clover heads*, the reaping of them may then be commenced. In America, this is effected by two implements, which are described in the *Trans. N. Y. Agric. Soc.* and were invented in Brookhaven, Suffolk county, New York, by Mr. L'HOMMEDIEU, and deserve to be recommended: we have therefore subjoined the following representations:

Dimensions.

1, 2, The shafts, 4 feet 4 inches long, and three feet asunder.

3, 4, The handles, 3 feet long, and 20 inches apart.

5, The fingers, or teeth, thirteen inches long.



The wheels are sixteen inches diameter.

This machine is drawn by one horse, and guided by a man or boy; it simply consists of an open box, about 4 feet square at the bottom, and about three [illegible] height, on three sides; to the fore part, which is open, fingers are fixed, similar to those of a cradle, about 2 feet in length, and so near as to break off the heads from the clover-stocks between them, which are thrown back

into the box as the horse advances. The box is fixed on an axle-tree, supported by two small wheels, two feet in diameter; two handles are fixed to the hinder part, by means of which the driver, while he manages the horse, raises or lowers the fingers of the machine, so as to take off all th of the grass; and, as often as the is filled with them, they are thro out, and the horse goes on as before.



This instrument is called a *cradle*, and is made of an oak board about 18 inches in length and 10 in breadth. The fore-part of it, to the length of 9 inches, is sawed into fingers; a handle is inserted behind, inclined towards them, and a cloth put round the back part of the board, which is cut somewhat circular, and raised on the handle; this collects the heads or tops of the grass, and prevents them from scattering, as they are struck off by the cradle, which may be made of different sizes, being smaller in proportion for women and children, who, by means of it, may likewise collect large quantities. Mr L'Hommedieu says, as soon as the clover is mown, it should be immediately raked into small heaps, and exposed about three weeks in the field, to promote the decay of the husk, otherwise it will be difficult to obtain the seed. These heaps should be occasionally turned, especially during wet weather. It may, however, be easily ascertained, whether the husks are sufficiently rotten, or dry, by rubbing the heads or tops between the hands: when that is effected, they should be housed, and the seed threshed out when convenient, and cleared with a wire riddle. Lastly, this species is a valuable substitute for the common clover, as it continues much longer in the land.

Upon the subject of collecting clover seed, Mr L'Hommedieu observes further; by sowing three or four pounds of seed to the acre, on light loamy soils, which yield eight or ten bushels of wheat or rye per acre, the clover will not be profitable to mow, but standing thin on the ground, the heads will be well filled with seed. The fields are to be kept up next year, till the seed is collected, by the machine represented above. On rich lands, no seed comes with the first crop, but the second crop being shorter and thinner, is commonly well seeded. Sometimes, indeed, considerable quantities of seed are gathered from the first crop, on land where wheat has been cut the same year: the stubble preventing the clover from growing too thick to produce seed. If the land be rich, and it is intended to sow the first crop, and collect seed from the second, eight lbs. are not too much for one acre.

Red clover is an essential article in the rotation of crops in Pennsylvania, and the immense riches which the whole state has acquired during the last twenty years, may, in part, justly be ascribed to this grass aided by the almost magical fertilising power of gypsum, by which more wealth has been introduced than would have resulted from the discovery of a gold mine.

If it is intended to sow clover upon winter barley, wheat, or rye, many farmers prefer sowing the seed in March, and when the ground is covered with snow; as it can be seen whether the seed is strewed evenly. If all the seed be sown in February or March, and a dry season should follow, while the roots are young and tender, the crop of grass will be lost. Mr L'Hommedieu therefore finds it a safer way, to sow one half the clover seed proposed for an acre, at the time the wheat is sown, and the other half on the same land, in the last of the winter, or the first of the spring.

Probably the diversity of opinion with respect to the proper time for sowing clover seed, may arise from the difference in the nature of the soils on which trials have been made. An experienced agriculturist (Edward Duffield, Esq.) of Philadelphia county, assures Dr Mease that he repeatedly failed in obtaining a crop when he sowed his clover in the autumn or winter, and that he is uniformly successful when he sows in the spring. His soil is a light loam.

The quantity of seed allowed to an acre is various, but it is evident, that the more seed, the more benefit will be derived from the grass, both as an ameliorator of the soil, and as a destroyer of weeds. The quantity of hay produ-

ced will also be much greater. Twenty pints to an acre, however, need not be exceeded. Mr Bordley says, a box for sowing clover seed on flat wheat *beds* rather than *ridges*, five and a half feet wide, exclusive of the water or opening furrow, seven feet inclusive, was made of light half inch boards, for the sides, bottom, and partitions. It was seven feet long, five or six inches wide, that the seed lying thin might easily shift about and not press heavily on the outlet holes. The box was three inches deep, and divided into seven parts, each division having two holes bored through the bottom half an inch in diameter, and placed diagonally. The holes were singed with a hot iron to smooth them. Square pieces of strong writing paper were pasted over the holes, on the inside of the box. A hole was burnt, with coarse knitting needles, through each paper. At about a third of the distance from each end of the box, were fastened strong leather straps, by which the box was held, and a little agitated in carrying it before the seedsman, in a direction crossing the beds, while the seedsman walked along the beds. By an experiment made by Mr. B it appeared, that the growth from the box sowing, was thicker, and more equally distant than that from the broad cast, and the plants were sufficiently close. The seeds were left on the ground of the field of wheat without any means used to cover them. The seven feet lands were preferred to 5½ feet lands. The water furrows were included both in the 7 feet and the 5½ feet lands. After many experiments, beds were preferred to ridges, 1. because the soil being alike in quality on the whole of the bed, the wheat grew equally well from edge to edge; 2. in reaping, the wheat was better saved; 3. the furrows being opened deep, the greatest rains presently glided into the furrows, and were by them conveyed into the main drains of this flat land. The beds were separated by deep water furrows formed by a double mould board plough, dipt deep by the power of only two horses.

When clean clover seeds are sown on a clean ground and harrowed in, numbers are smothered under small lumps of earth, as well as under larger ones. This waste does not take place when seed is left on the ground, or under snow.

Clover seed of a bright yellow, with a good quantity of the purple and brown coloured seed among it, (which shews the maturity of the seed) should be preferred. When thoroughly ripe, and well got in, the vegetative power will continue for three or four years. Lancaster county seed is preferred to that of any other place. The late A. C. Du Plaine gave me the following account of a crop of clover which he raised at Kensington on one acre of ground.

He ploughed deep in the autumn and manured with leached or spent ashes, in the following spring he ploughed in March and sowed barley after one harrowing; he harrowed again, then sowed clover seed at the rate of 20 lbs. to the acre: and reversing the harrow, and filling the spaces between the teeth with brush, went over the ground. He had *forty five* bushels of barley per acre, and a small cutting of clover the first year in September: but the succeeding summer this ground yielded *eight* tons at three cuttings. Mr D was a man of the highest integrity, the account may therefore be depended upon.

Great care must be taken to prevent cattle from becoming *hoven*, by feeding on green clover. This is done by permitting them to fill themselves with other pasture or food, and at first turning them into the clover field for a short time, say twenty or thirty minutes, in the middle of the day, *and turn them out the moment they shew a disposition to wander or lie down*. They must never be turned in, during wet weather. This mode of pasturing is only recommended as the most saving to those who will not *soil*, as advised under the article Cattle.

Two kinds of red clover are sown in Pennsylvania. One is particularly distinguished by the name of Dutch clover, and grows much better, and with a thicker stalk than the other. From this peculiarity, the hay made of it is not equal in quality to that made from the common sort, but is preferable as a preparative for wheat, if ploughed in, or after one crop; and would answer admirably for soiling. It may be well to have both kinds of clover on a farm.

Hogs thrive exceedingly upon clover, and when *soiled*, no food is more economical. A statement of the number of hogs fed by a certain quantity of clover, near Wilmington, Delaware, shall be given under the article "Hogs."

In the State of Pennsylvania, clover

is not, in general, permitted to continue in the ground longer than two years. It is then ploughed in, and other grain sown. See WHEAT, RYE, OATS, ROTATION OF CROPS, PASTURE, HAY.

3. The *procumbens*, or hop-clover, hop trefoil, which grows in dry [illegible] dows and pastures. It flowers in [illegible] months of June and July. When mix ed with common clover, on light la[illegible] it makes a most excellent fodder. [illegible] plant is variously called hop-grass [illegible] nonsuch.

4. The *repens*, or white-clover, which abounds in meadows and pastures. It [illegible] delights in light land, where it [illegible] thrive luxuriantly if frequently [illegible] It is usually sown with red clo[illegible]r, rye-grass, or barley, and is in [illegible] September. It produces the sweetest hay on dry land, especially when mixed with hop-clover and rye-grass; and possesses this advantage over the common clover, that it will admit of being irrigated. Horses, cows, and goats eat it, but sheep are not fond of it, and hogs totally refuse it.

White clover, whether soiled or pastured, is one of the most valuable grasses for cattle. It is evidently a natural grass of the country, and uniformly appears in our meadows south of the city, when closely nibbled by sheep or cattle; and a gentleman who has travelled much through the hostile Indian country, says, he has seen fields covered with this grass. The report, therefore, as stated, by Mr. STRICKLAND, to prevail among the Indians, that this plant is not to be met with *but where white men have trodden*, must be without foundation.

The sweet blossoms of white clover powerfully attract the bees all summer, but it is chiefly in the months of May and June that this aliment is collected and stored in hives: and it is observed that clover honey may be easily distinguished from that of any other flowers in the hive. It is much to be regretted, though the flowers of the red clover yield the greatest quantity of honey, yet the honey bees profit but little by them, because the tubes or nectaries of the florets are so long, that they cannot reach to the bottom, where the honey lies; for which reason it is observed that the red clover is but little visited by bees; they yield place to the great hermit bees, or wood-borer, and humble bees, which being furnished with strong beaks that sheath their tongues, pierce the lower parts of these tubes, and suck the honey.

White clover, when mixed with Timothy, or green grass, (*poa viridis*) makes excellent hay. See HAY.

CLOVES. The unexpanded flower-buds of an East Indian tree (*Caryophyllus aromaticus*), somewhat resembling the laurel in its height and in the shape of its leaves.

The leaves are in pairs, oblong, large, spear-shaped, and of bright green colour. The flowers grow in clusters, which terminate the branches, and have the calyx divided into four small and pointed segments. The petals are small, rounded, and of bluish colour; and the seed is an oval berry.

In the Molucca islands, where the preparation of different spices was formerly carried on by the Dutch colonists to great extent, the culture of the clove-tree was a very important pursuit. It has even been asserted that, in order to secure a lucrative branch of commerce in this article to themselves, they destroyed all the trees growing in other islands, and confined the propagation of them to that of Ternate. But it appears that, in 1770 and 1772, both clove and nutmeg trees were transplanted from the Moluccas into the islands of France and Bourbon, and subsequently into some of the colonies of South America, where they have since been cultivated with great success.

At a certain season of the year the clove tree produces a vast profusion of flowers. When these have attained the length of about half an inch, the four points of the calyx being prominent, and having in the middle of them the leaves of the petals folded over each other, and forming a small head about the size of a pea, they are in a fit state to be gathered. This operation is performed betwixt the months of October and February, partly by the hand, partly by hooks, and partly by beating the trees with bamboos. The cloves are either received on cloths spread beneath the trees, or are suffered to fall on the ground, the herbage having previously been cut and swept for that purpose. They are subsequently dried by exposure for a while, to the smoke of wood-fires, and afterwards to the rays of the sun. When first gathered they are of reddish colour, but by drying they assume a deep brown cast.

This spice yields a very fragrant

odour, and a bitterish, pungent, and warm taste. It is sometimes employed as a hot and stimulating medicine, but is more frequently used in culinary preparations. When fresh gathered, cloves will yield on pressure a fragrant, thick, and reddish oil; and by distillation a limpid essential oil. The latter is imported into Europe, but is frequently adulterated, and sometimes even to the amount of nearly half its weight. Oil of cloves is used by many persons, though very improperly, for curing the tooth-ach, since from its pungent quality it is apt to corrode the gums, and injure the adjacent teeth. When the tooth is carious, and will admit of it, a bruised clove is much to be preferred.

Cloves acquire weight by imbibing water, when suspended above it, even at some distance. The Dutch, who were formerly in the sole possession of the clove-trade, are supposed to have frequently taken advantage of that property; but such nefarious practices may be easily detected, by squeezing the cloves with the hand, and expressing their moisture.

CLYSTERS, or INJECTIONS, or *Lavemens*, are liquid remedies introduced into the larger intestines, by the rectum. The most usual clystering machines are those consisting simply of the bladder of a hog, sheep or ox, in which an ivory pipe is fastened with pack-thread. The French and Germans employ, in preference, a long pewter syringe by which the liquor may, with more ease and expedition, be drawn in, and likewise more forcibly expelled, than from a bladder. Both methods, however, are in many instances liable to great objections, especially the former, which cannot be administered without the assistance of another person, even though the patient should possess sufficient strength and dexterity to perform the operation. Hence we cannot in justice to Mr. SAVIGNY, of King-street, Covent-garden, omit to mention his newly invented *machine for lavemens;* which, for simplicity of construction, facility in using it, cleanliness and durability, far surpasses every former contrivance. This machine is ingeniously adapted both for private use, and to admit of assistance. One of its essential advantages is, that the injection may be received into the body, without the least intervention of *air;* because the cylinder containing the liquid is provided with a piston, which, by gently pressing it down upon the fluid, till it appears on the top of the ivory pipe, expels the air, and thus prevents its introduction into the bowels.

Clysters form a very important class of medicines, which, if understood and applied, not only serve to evacuate the contents of the belly, in cases of obstinate costiveness, but also to convey into the system medicinal preparations of great activity. Thus, opium, the Peruvian bark, &c. when they cannot be taken by the mouth, may be given in much larger doses, and with less danger: nay, the most nutritive and strengthening liquids may, in this manner, be administered to persons unable to swallow, so that their lives may be supported for many months, and even years, by means of clysters alone. In short, it may without hesitation be affirmed, that injections are more conformable to the intricate functions of the animal body, and doubtless safer, than the introduction of medicines by the stomach.

Although clysters should never be administered too *hot*, or too *cold*, yet there are certain complaints accompanied with such debility of the larger intestines, and the abdominal muscles, as renders the application of *cool* liquids sometimes necessary: such cases, however, must be determined by the experienced practitioner. In general, therefore, these remedies are given in a tepid or lukewarm state, that is, from the 80th to the 96th degree of FAHRENHEIT's scale. The quantity used for adults, is from half a pint to one pint; and for children, according to their age, from two or three spoonfuls to half a pint.

Anodyne Clyster. Take of either linseed-tea, or new milk, from half a pint or three quarters of a pint, and add from 40 to 60 drops of laudanum.

Laxative Clyster. Milk and water, eight ounces each; sweet oil, or fresh butter, two ounces; and if a stronger dose be required, add one ounce of GLAUBER's salt, or two table spoonfuls of common salt. In inflammatory or putrid disorders, however, it will be more proper to inject a clyster composed of two-thirds of thin gruel, and one-third of strong vinegar.

For the various forms and ingredients of clysters, to answer different purposes, we refer to the articles, COLIC, COSTIVENESS, DYSENTERY, FLATULENCY, HYSTERICS, URINE, WORMS, &c.

COACH, a commodious vehicle for

travelling, invented by the French. Even in France, however, the coach was not very anciently known, since it is scarcely mentioned before the reign of Francis I. At first, its use was confined to the country; and writers observe that there were at this [illegible] more than two coaches in Paris: [illegible] one that of the queen, and the other that of Diana, natural daughter [illegible] Henry II. The first courtier who [illegible] one was Jean de Lava de Bois Daup[illegible], whose enormous bulk disabled him [illegible]m travelling on horseback. The [illegible] coach ever publicly seen in En[illegible]nd, was [illegible] of the equipage of [illegible], earl of Arundel, in the reign of [illegible]zabeth. Mr. Tull, the son of a gentleman who wrote on husbandry, first imported the post chaise. Hackney-[illegible]ches are [illegible] exposed to hire, in the streets of London and other great cities, at rates fixed by authority. Stage-coaches are those which undertake to convey travellers from one city to another. Mail-coaches are stage-coaches of a peculiar construction, for the prevention of overturning; and which, for a certain consideration, carry the mails, or bags of letters, to and from the general post office, protected by a guard, and subject to the regulations of government. They are obliged to depart and arrive at certain [illegible], and the number of their inside pass[illegible]ers is restricted to four. J. Palme[illegible] [illegible]q. M.P. for Bath, has the merit of [illegible]his establishment, which experience has shown to be of the greatest advantage to the trade and correspondence of Great Britain.

COAKS, fossil-coals, charred, or made to undergo a process similar to that by which *charcoal* is produced. Coaks are used for exciting intense heat, as in smelting iron-ore; and for operations where the acid and oily particles of coals, of which they are deprived by charring, would be detrimental; as drying malt. [Anthracite is a natural coak, and might be used in smelting of ores in lieu of the charcoal of wood, or of stone coal.—T C.]

COAL, in mineralogy, a solid, inflammable, substance, commonly used for fuel: it consists of various species; the principal of which are:

1. [Stone coal, Glance coal. or Anthracite, containing no bitumen, being a natural charcoal of coal.

2 Bituminous coal, either common as that from Liverpool, Virginia, or Pittsburgh; or cannel more properly kindle coal, smooth, dull, breaking with a conchoidal fracture, and containing much bitumen: chiefly from the neighbourhood of Wigan in Lancashire.

3. Lignite, or Bovey coal.

Anthracite, abounds on the waters of the north east branch of the Susquehanna, and in Rhode Island. It is used by blacksmiths, and might be used for smelting in lieu of charcoal. Bituminous coal abounds on the waters of the west branch of the Susquehannah, on the waters of the Monongahela, Aleghaney, and Ohio; and in Virginia. Lignite is found in small veins often accompanied by amber, in alluvial soils. The coal formation, is chiefly in secondary formations, in basins between the mountain limestone, and the red ground or new red calcareous sandstone of England. Anthracite is confined to the transition formations.—T C.]

Coals are applied to various purposes, and are eminently useful in the smelting of ores, when burnt into *coak* (to which we refer); but, by these processes, considerable qnantities of tar and pitch have hitherto been, inattentively, wasted To obviate these losses, the ingenious Lord Dundonald erected ovens of a peculiar construction, for burning pit-coal into coak, and, at the same time, for collecting, in separate vessels, the volatile alkali, pitch, oil, and tar, which would otherwise have been dissipated. For this invention he obtained a patent, on the 30th of April, 1781, for 14 years; which term was afterwards, by an act of parliament, extended to 20 years, to commence from the 1st day of June, 1785 His ovens are so contrived, as to admit the external air to pass through the vessels, or buildings containing the coal, from which any of the above-mentioned substances are to be extracted. After being kindled, the coals are decomposed by a slow, but imperfect combustion, without dissipating the ingredients. The residuum in the oven forms excellent cinders, or coak; while the volatile particles are condensed in reservoirs, placed at proper distances.

Tar distilled from coal, was thought by Lord Dundonald, to be far superior to the common vegetable tar, in preserving timber from the effects of the weather, and the bottoms of ships from the destructive worm of the West Indies. Some comparative experiments were tried at New York about thirteen years since, by which it appeared, that boards covered with common tar, and sunk in the river for several months,

were much eaten by worms, while a plank covered with the coal tar remained untouched. In consequence of this apparent proof of superiority, the bottoms of several vessels were coated with the tar, bought at the rate of 40 dollars per barrel. But the result of these trials has not served to extend and insure its character.

Captain Truxtun informed Dr. Mease, that he "applied it to the bottom of a ship, and discovered nothing in it like a safe-guard from the worm;" and added, "that some years after Captain Sarley, of New-York, commander of the ship America, payed all the timbers and planks of his vessel with it, as a preservative of the wood, and I was informed on the ship's return from her first voyage, that it had caused a manifest decay of the frame" From another source, Dr. Mease heard that the strong smell of the coal tar penetrated into the hold of the America, and impregnated the cargo of teas which was on board A friend also informed him that the coal tar, put on in this city, came off like a sheet of lime-wash, and left his ship's bottom bare, at Demarara, where the worm commits great ravages, and greatly injured his vessel.

[The following account appears to me worth inserting.—T. C.]

The component parts of coals are principally charcoal and bitumen

This invaluable mineral is found in beds, or strata, frequently betwixt clay-slate and sand stone, and seldom betwixt those of lime-stone. It chiefly occurs in the northern hemisphere, particularly in countries which lie nearly in the same latitudes with Great Britain; in Siberia, Germany, Sweden, France, Canada, and Newfoundland; and in some of the northern parts of China. It is stated to be very abundant in New Holland, but we have no distinct account of coal in the continent of Africa. No fewer than seventy different kinds of coals are brought to the London market, the value and prices of which greatly differ. Of these the coals called *Wall's-end*, from the name of the pit, near Newcastle, whence they are obtained, usually bear the highest price.

Some kinds of coal are laminar, and others compact. They in general burn freely, with a bituminous odour, and leave a considerable residuum.

Common Coal, or *Pit Coal*, is of black colour, and has generally a slaty structure and foliated texture. In handling it stains the fingers: and in burning it cakes more or less during combustion. Its component parts are usually charcoal and bitumen, with a small portion of clay, and sometimes with pyrites, or sulphate of iron. What is called slaty coal contains a greater portion of clay than other kinds.

Some foreign writers have ascribed the great wealth possessed by this country to the coals which are here produced in such abundance, and which facilitate, in a very essential degree, nearly all its manufactures, and consequently are the means of promoting its commerce to an extent which is possessed by few other countries. All our great manufacturing towns, Birmingham, Sheffield, Leeds, Glasgow, &c. are situated either in the midst of coal districts, or in places to which coals are conveyed, with little expense, by canal carriage.

Coals are principally obtained from the neighbourhood of Newcastle-upon-Tyne, Sunderland and Whitehaven. The particular places whence they are produced have the name of *collieries*, and the mines from which they are dug are called *pits* The deepest of these are in Northumberland, and are worked at more than 900 feet below the surface of the earth. At Newcastle there is a coal-pit near 800 feet in depth, and which, at that depth, is wrought five miles horizontally, quite across, and beneath the bed of the river Tyne, and under the adjacent part of the county of Durham. At Whitehaven the mines are of great depth, and are extended even under the sea, to places where there is above them sufficient depth of water for ships of great burthen, and in which it is said the miners are able sometimes to hear the roaring of the water.* On the contrary, in some parts of Durham the coal lies so near the surface of the earth that the wheels of carriages lay it open, and in such quantity as to be sufficient for the use of the neighbourhood.

The beds of coal are of various thickness, from a few inches to several feet, and in some places it is found advantageous to work them at a very great depth, although their thickness does not exceed four or five feet. The thickest bed of English coal, of any extent, is that of the main coal in Staffordshire, which measures about thirty feet. There are frequently several beds above, and parallel to, each other, separated by strata of slate, sand-stone, and other minerals. Coal is never found in chalk, and very rarely in limestone.

At Whitehaven the principal entrance to the coal-mine for men and horses is by an opening at the bottom of a hill, through a long passage hewn in a rock. This, by a steep descent, leads to the lowest bed of coal. The greatest part of the descent is through spacious galleries which continually intersect other galleries; all the coal having been cut away, except large pillars, which, in deep parts of the mine, are three yards high, and about twelve yards square at the base; such great strength being there required to support the ponderous roof. There are three distinct parallel strata of coal, which lie at considerable distance above each other, and which have a communication by pits that are sunk between them. These strata are not always regularly continued in the same plane; the miners occasionally meet with veins of hard rock, which interrupt their further progress. At such places the earth on one side of the vein appears to have sunk down, while that on the opposite side has its ancient situation. In some parts it seems to have sunk fifteen or twenty fathoms, and in others not so much as one fathom. These breaks the miners call *dykes*. When they come to one of them, their first care is to discover whether the coal in the part adjoining be higher or lower than that in which they have been working; or, to use their own terms, whether it be cast down or cast up. For this purpose they examine attentively the mineral strata on the opposite side, to see how far they correspond with those which they have already passed through. If the coal be cast down, they sink a pit to it; but if it be cast up, the discovery of it is often attended with great labour and expense.

In general the entrance to coal mines is by perpendicular shafts, and the coals and workmen are drawn up by machinery. As the mines frequently extend to great distances horizontally beneath the surface of the earth, peculiar care is necessary to keep them continually ventilated with currents of fresh air, for the purpose not only of affording to the workmen a constant supply of that vital fluid, but also to expel from the mines certain noxious exhalations which are sometimes produced in them.

One of these, denominated *fire damp*, is occasioned by the generation of hydrogen gas, or inflammable air. This gas, when mixed with the common air of the atmosphere, explodes with great violence, on the approach of a lighted candle, or any other flame; and has, at different times, occasioned the loss of many valuable lives. It is a singular circumstance, that although it is immediately set on fire by a flame, yet it cannot be kindled by red hot iron, nor by the sparks produced by the collision of flint and steel. Hence a machine is adopted in the mines near Whitehaven and Workington, in which a wheel formed of steel, and in shape somewhat like that of a razor grinder, is turned round with very rapid motion against a series of flints, and in such manner as to yield to the miners sufficient light to carry on their work in places where the flame of a candle or lamp would occasion the most dreadful explosions. Without some contrivance of this kind, the working of these mines would be totally impracticable.

Another injurious exhalation in coal mines arises from the formation of carbonic acid gas, or fixed air, and is called *choke damp*. It is the property of inflammable air to rise to the upper parts, but this, on account of its weight, occupies principally the lower parts of mines, and occasions death by suffocation, though it is by no means so fatal as the former. In some mines a prevention of injury arising from each of these is attained, by ascertaining the particular crevices in the coal from which they issue, confining them at those places within a narrow space, and, if possible, conveying them out of the mines, through long pipes, into the open air.

There is yet another danger attending coal mines which requires to be provided against, and this is inundation. Many mines have been destroyed by the flooding of water which springs up within them. The modes by which this was formerly extracted were extremely laborious, and in numerous instances entirely inefficacious. By means, however, of the fire or steam engines now in use, the quantity of water raised from mines is perfectly astonishing. Four engines in one of the collieries at Whitehaven discharge from it more than 20 hogsheads per minute, or upwards of 30,000 hogsheads in every 24 hours.

The coal trade which at present affords so important a nursery for our seamen, and in numerous other respects yields advantages of the most beneficial description to this country, was entirely unknown a few centuries ago.

Coals were not generally adopted as fuel until the beginning of the reign of Charles I. They were however noticed in documents anterior to the reign of Henry III.; that monarch in the year 1234 having renewed a charter granted by his father to the inhabitants of Newcastle, by which they were permitted to dig coal upon payment of 100*l.* per annum. Coals had been introduced into London before 1306, for in that year the use of them as fuel was prohibited, from the supposed tendency of their smoke to corrupt the air. About the beginning of the 16th century, the best coals were sold in London at the rate of 4*s.* 1*d* per chaldron, and at Newcastle for no more than 2*s* 6*d.* During the ensuing century, however, they were received into such general use, that, in 1648, on a scarcity of coal in London, many of the poor are said to have died from want of fuel. The whole quantity of coals imported into London has been estimated, on an average of four years ending in March, 1815, to amount to 1,170,000 chaldrons per annum.

Some writers have imagined coal to be the remains of antediluvian timber, which floated upon the waters of the deluge until several strata of mineral substances had been formed; which others conceive to have been antediluvian peat-bog. It is called *pit-coal* from the circumstance only of its being obtained from a mine or pit; and in London, for no better reason than its having been conveyed thither by sea, it has the name of *sea-coal.*

Its uses as fuel are too extensively known to need here any observations. By the distillation of coal an inflammable gas is produced which has of late been introduced for the lighting of manufactories, and lighting several of the streets and shops of London. This gas is conveyed by pipes from the reservoir in which it is collected to great distances; and the light which it yields is peculiarly brilliant and beautiful. *Soot* is produced from the smoke of burnt coal, and is used as a manure for cold, moist, and clayey meadows and pastures, and pounded coal has been applied to the same purpose in some parts of the continent. By a process called charing, coal is divested of it's humid, acid, and bitumenous particles, and is converted into a kind of cinder called *coak.* This is employed in cases where intense heat is requisite, as for the smelting of iron ore; and likewise where its acid and bitumenous particles would be detrimental, as in the drying of malt.

What is commonly termed *culm* is the refuse or dusty coal, produced in working the common coals. It contains much earthy matter, will not kindle in an ordinary fire-place, but produces considerable heat and flame in a furnace, where a strong current of air is introduced. In England it is exempted from the high duty imposed on other coals, and sells at a very low price. It is used for burning lime, making salt, and in steam-engines.

Cannel Coal is of a black colour, with little lustre, is not laminar, but breaks in any direction like pitch, and does not stain the fingers.

This highly inflammable kind of coal is found very abundantly in the neighbourhood of Wigan in Lancashire, where there is an entire stratum of it about four feet in thickness. It is also found near Whitehaven; in some of the pits at Newcastle; and in some parts of Scotland. Doubts have been entertained respecting the name of this coal; but when it is recollected that in Lancashire, whence it is chiefly brought, the word candle is usually pronounced with the omission of the letter *d*, and that in many instances the coal is used by the poor as a substitute for candles; these will be immediately removed. In Scotland it has the name of *parrot coal.*

No kind of coal takes fire so readily, or burns with so cheerful and brilliant a flame as this; and its not soiling the fingers like pit coal renders the use of it peculiarly pleasant; but it does not cake, and soon burns away. When first kindled it crackles and splinters very much; and on this account would be dangerous, were it not easily prevented from so doing by previously immersing it for a little while in water. Cannel coal has much the appearance of jet. It admits of being turned in a lathe, and takes a good polish; and snuff-boxes and trinkets made of it have in many instances been sold as jet. Of all the coals that are used for producing gas for the lighting of large manufactories, &c. none is said to be so suitable as this.

Stone Coal, Kilkenny Coal, Welch Coal, or *Glance Coal,* is of a dark iron black colour, with metallic lustre, and foliated texture; and consists almost entirely of charcoal.

Unlike most other kinds of coal this occurs both in stratified masses, and in lumps nested in clay. It is found in several countries of the continent,

in Wales, Scotland, and Kilkenny in Ireland.

When laid on burning coals it becomes red hot, emits a blue lambent flame in the same manner as charcoal; and is at length slowly consumed, leaving behind a portion of red ashes. No smoke nor soot is produced from this coal, but on the contrary it whitens the places where the fume is condensed; and the effluvia which it gives out are extremely suffocating.

This coal is chiefly used in the drying of malt.

Pitch is of a black or brownish black colour, and velvety appearance. It is found massive in plates, and sometimes in the shape of branches, with a somewhat woody internal structure.

It is stated that in the district of Aude, in France, there are more than 1,000 persons constantly employed in the fabrication of pitch coal into rosaries, buttons, ear-rings, necklaces, bracelets, snuff-boxes, and trinkets of different kinds. Near 50 tons weight of the coal are annually used for this purpose; and articles to the value of 18,000 livres, are said to be sold in Spain alone. In Prussia the amber diggers call it *black amber*, because it is found accompanying that substance; and because, like amber, it is faintly electric, or attracts feathers and other light objects when rubbed. They manufacture it into various ornamental articles, and sell these as black amber, to ignorant persons, at a great price.

This coal, which is found at Newcastle, Whitehaven, and in other parts of England, is used as fuel, either in a natural state or when converted into coke. It burns with a greenish flame, and strong bitumenous smell, and leaves a light yellowish coloured ash.

Bovey Coal, Brown Coal, or *Bitumenous Wood*, is of a brown colour, and in shape exactly resembles the stems and branches of trees, but is usually compressed. It is soft, somewhat flexible, and so light, as nearly to float when thrown into water.

The greatest abundance of this coal occurs at Bovey, near Exeter, from which place it derives its name. The lowest stratum is worked at the depth of seventy five feet beneath the surface of the earth. It is also found in Scotland, Ireland, and Germany.

As fuel, the Bovey coal is used only by the poorest classes of the community, since, notwithstanding its burning with a clear flame, it emits a sweetish but extremely disagreeable sulphureous gas, which is injurious to the health of the inhabitants. It is principally used for the burning of lime, and for the first baking of earthenware.

Coal-Balls: Take two-thirds of soft, mellow clay (for instance, a ton), which is free from stones, and work into it three or four bushels of small sea-coal previously sifted; form this composition into balls, or cakes, about three or four inches in diameter, and let them be thoroughly dried. When the fire burns clear, place four or five of these balls in the front of the grate, where they will soon become red, and yield a clear and strong heat, till they are totally consumed. The expense of a ton of this composition is but trifling, when compared with that of a chaldron of coal, as it may be prepared at one-fourth of the cost, and will be of greater service than a chaldron and a half of the latter.

It may be useful to mention that coal preserved in magazines, when not duly ventilated, has inflamed. This accident once happened at Brest, in France.

§ *Indications of coal.* It is hardly possible to give any useful notions on this subject to persons who have paid no attention to geology, or subterranean geography. But it may be observed briefly: 1st. It is hopeless to search for coal mines in a *primitive* country: that is, in the strata called granite, gneiss, mica slate, soapstone, clay slate, or syenite. Sometimes powerful floods or some other cause may have washed away and denuded some of the intermediate strata between granite and coal, as at Richmond, Virginia: but these are rare and anomalous cases. 2. The class of rocks called *transition*, such as grauwacke, and grauwacke slate, often contain anthracite, glanz, or smokeless coal; as in Schuylkill and Luzerne counties, Pennsylvania. 3. The class of rocks called *secondary* or horizontal, contain almost all the known coal-basins. Every coal field, or coal basin in what is called geologically the independent coal formation, consists of a separate series of irregularly elliptical strata, dipping from the out break or crop toward the centre of the basin. These are found below the stratum called in England the floetz magnesian limestone, and usually extend downward toward the mountain or Derbyshire limestone, which rests on the old red sand stone. A coal-field consists of various strata of slate-clay or shale at the top, containing pyrites and ve-

getable impressions, of ferns, pines, bamboos, &c then coal, then argillaceous gravelly or freestone strata, then coal, then argillaceous gravelly and freestone strata, often alternating with basalt, or whin or toadstone, then coal again, and so on 4. The great coal beds (coal strata, or coal measures) that constitute the independent coal formation, are above the mass of rock salt, and the strata connected with it. 5. The lignite or coal half wood, half-coal, is never to be relied on as an indication of profitable coal strata. 6 In searching for coal, attend to the impressions of organic fossils. There are no animal remains except very rarely land muscles in coal strata: there are no vegetable impressions in the strata above or below: (except in the transition anthracite, very far below the bitumenous coal. 7. The slate clay over coal is often blackened by the bitumenous soot of coal beneath, and contains pyrites. 8. In searching for coal, examine in streams, gullies, and ravines, the edges of the strata: remark if they consist of the strata usually accompanying coal, and trace them upward, to where they crop out, or break out to the day.

Consult the 1st vol. of WILLIAMS's Mineral Kingdom, the 4th vol. of the Geological Transactions of London, WHITEHURST's Enquiry into the Original State and Formation of the Earth, and the article COAL in REES's Encyclopædia: in which publications study the nature and successions of the strata or measures usually found in coal fields.—T. C.]

COAL-FISH, or PILTOCKS, (*Gadus carbonarius*) are a kind of cod with three dorsal fins, no beard on the under jaw; the under jaw longer than the upper, the side line straight, and the mouth black within.

They are frequently two or three feet long, and twenty pounds and upwards in weight.

These fish are indebted for their name to the dark colour which their body generally assumes, when they have attained their full growth. To the inhabitants of the Orkney Islands, and of the extreme northern parts of Scotland, they afford a most important supply of food at a season of the year when the poor are deprived of almost every other means of subsistence. At the approach of winter, when the seas are stormy, myriads of these fish run into the bays, and they continue in the immediate neighbourhood of the same coasts till the months of February and March. They are nearly as important an object of pursuit on account of their *livers* as for their *flesh* From these is obtained a considerable quantity of oil, which is used for burning in lamps, and for numerous other purposes. The fry of these fish approach the Yorkshire coasts in the months of July and August, and, when four or five inches in length, are much esteemed as food; but the elder fish are so coarse and bad that where other food is to be obtained few people will eat them. [illegible] salted and dried, however, they are rendered firm and palatable.

Coal-fish are usually caught with lines. The best bait is a sprat or limpet parboiled. The Shetlanders use the latter, and seated on rocks, or in boats, are very expert in catching them.

COATING, in chemistry, is used principally for the purpose of defending certain vessels from the immediate action of fire; thus, glass retorts and the inside of some furnaces, are coated with various compositions

COATING, in electricity, means the covering of electric bodies with conductors, or the latter with the former, or, lastly, electrics with other electrics. Electrics are coated with conductors for the purpose of communicating to, or removing from their surfaces, the electric fluid in an easy and expeditious manner: otherwise an electric body, on account of its non-conducting property, cannot be electrified or deprived of the electric fluid without touching almost every point of its surface with an electrified or other body. This coating generally consists of tin-foil, sheet lead, gilt paper, gold leaf, silver leaf, or other metallic body, either in the form of a thin extended lamina, or in small grains, such as brass filings and leaden shot The coating may be fastened to the surface of the electric by means of paste, glue, wax, or other adhesive matter.

COBALT is a semi-metal of grey colour with a shade of red, brittle, somewhat harder than silver, nearly eight times as heavy as water, is attracted by the magnet, and is itself capable of being rendered permanently magnetical.

The ores of cobalt are not numerous, and are for the most part, combinations of this substance with other metals, or of its oxides with arsenic or sulphuric acids.

The name of this metal implies an evil being, and is said to have been given on account of the vapour of arse-

nic which issues from it, tormenting the miners, and making them believe that they are afflicted by wicked spirits. Hence it was once customary in Germany to introduce into the church service a prayer that God would preserve miners and their works from *kobalts* and *spirits*.

Cobalt is found in several parts of Europe, but most plentifully in the southern borders of France, and in Saxony; and the cobalt ores of Hesse, although they were formerly used for [illegible] purpose than the mending of [illegible]ds, are said now to yield a clear [illegible]fit of nearly 15,000*l*. a-year. Some parts of our Great Britain yield this substance in considerable abundance, particularly the Mendip hills in Somersetshire, and a mine near Penzance in Cornwall.

After the ore is taken from the earth it is broken into pieces about the size of a hen's egg, and the stony parts are picked out The sorted mineral is then pounded in mills, and sifted through brass-wire sieves. The lighter particles are next carried off by water. After undergoing some other preparations, in order to rid it of the impurities and foreign matters with which it is connected, it appears in the form of a dark grey oxide. The working of the cobalt ores in Germany is considered so injurious, on account of the arsenic with which they are combined, that much of the labour is performed by criminals who are condemned to it for the commission of crimes which, by the laws of the country, have deserved the punishment of death.

As a metal, cobalt was unknown till the year 1733, when it was discovered by a celebrated Swedish chemist whose name was BRANT. In its metallic state it is not employed in the useful arts; but in a state of oxide it is found extremely valuable in the colouring of porcelain, in painting, enamelling, and for other purposes.

We are informed that cobalt and ultramarine form the most permanent blue colours with which we are acquainted, that the old painters generally used them for the representation of the sky and of blue drapery, and that this is the reason why these parts of some old pictures have been found so durable.

Zaffre is an oxyde of cobalt mixed with about three times its own weight of calcined and pounded flint. It has been chiefly imported into this country from Saxony and Bohemia, but is now also manufactured from the cobalt dug from the mines in Mendip Hills and in Cornwall. In Staffordshire there are several persons who carry on a considerable trade in preparing this colour for the earthen-ware manufacturers of that country.

This substance is extremely valuable for the colouring of porcelain and glass, from its resisting, without change, the effects of the most intense heat. Hence also it is advantageously used for giving various shades of blue to enamels, and to glass manufactured in imitation of lapis lazuli, turquoise, sapphire, and various precious stones. So intense is the colour imparted by it that a single grain of zaffre will give a full blue tint to two hundred and forty grains of glass.

Smalt is a kind of glass, of dark blue colour, formed by melting zaffre with three parts of sand and one of potash; when this substance is ground to a coarse powder, it has the name of *strewing-smalt*, and is much used by sign painters, as an ornamental filling up of the vacant space betwixt the letters of signs. In Germany it is frequently employed instead of sand for the purpose of drying ink after writing. The same substance reduced to a perfectly fine or impalpable powder, is the article which is sold under the name of *powder-blue*, and which is not only used by laundresses and others in the getting up of linen, but also as the basis of several kinds of paint; and by the manufacturers of writing and printing papers, to give a blue tinge to those articles.

A solution of the oxyde of cobalt in spirit of salt (muriatic acid,) and afterwords diluted till nearly the whole of its colour disappears, forms one of the most beautiful *sympathetic inks* with which we are acquainted If a landscape be drawn with Indian ink, and afterwards the foliage be washed over with this solution, it will have no peculiar appearance; but on holding the paper near the fire, the part representing the vegetation will gradually assume a green tint, which will subside on a removal of the paper into a cool situation.

[Cobalt ore is found in primitive trap, at Chatham, near Middleton, Connecticut.—T C.]

COBWEBS, which bespread the ground in autumn, have been supposed, in North Carolina, to cause the *staggers* among horses; but whether they are taken through the nose, or mouth,

or both, seems to be yet unsettled. There is an interesting paper, on this subject, in the "*Recreations*" of Dr. ANDERSON, vol. i. but the discussion of the question may be properly deferred until we come to the article STAGGERS.

[Pills of cobweb are, among country people, a specific against the ague, and have even been used by regular physicians for that purpose. Cobweb is also used as a styptic to stop the blood of a cut.—T C.]

COCCULUS *Indicus*, or INDIAN BERRY, is the poisonous fruit of the *Menispermum*, L. or Moon-seed, an exotic genus of plants, growing in the southern parts of Europe, whence it is imported. It possesses an intoxicating property, and is on that account too frequently mixed with malt liquors, though such nefarious practice is expressly prohibited by act of parliament. The seeds of this plant are made into a paste in the Levant, where it is employed as a specific for cutaneous eruptions.

To the great scandal of some brewers, this drug is sometimes mixed with small beer, by which means it acquires an intoxicating quality, and enables them to assert the superiority of their manufacture over that of the rest of the trade, though they profess to use a smaller quantity of malt.

COCCUS, a genus of insects, comprising twenty-two species, which are principally denominated from the plants they frequent. The most remarkable of these are:

1. The *Coccus hesperidum*, or green-house bug, which chiefly infests orange, and other plants in green-houses. When young, it runs upon the trees, but afterwards settles on some leaf, where it deposits a great number of eggs, and dies.

2. The *Coccus malorum*, or apple-tree Coccus, which, as soon as it fixes on a tree, communicates a corrosive ichor, that affects the bark, even after the insect is removed, in a manner similar to a gangrene; so that it becomes blotched, and full of deep holes, in consequence of which, it decays and dies. This insect preferably attacks the tender buds of young trees, and may be easily removed by means of a painter's hard brush, without injury to the plant, if it has not had sufficient time to bury itself in the bark. It also settles in such cavities as are frequently produced in the stems of trees, by incautiously tearing off the branches, or by any other wound. Being thus protected from the rain, these vermin can only be eradicated, by scooping them out, cutting off every irregular prominence, scraping off all loose scales from the bark, and then covering it with Mr. FORSYTH's composition, which will not only defend it against their devastations, but, by bringing on a smooth, clean bark, will admit of its being washed and cleaned afterwards, without difficulty. This process will preserve the tree, both from the depredations of these insects, and from those of many others, which shelter themselves in the inequalities of a rough bark, and will, at the same time, give it additional health and vigour. See APPLES.

3. The *Peach Coccus*, which Dr ANDERSON calls gall-nut, settles only on the twigs of peach-trees, where it deposits innumerable eggs These may be eradicated by carefully brushing the twigs, in the spring, with a hard brush, in the direction of the buds; by which simple means many of them may be detached, and their numbers greatly reduced. Where the insects are very close together at the points of the twigs, the latter may be cut off, and carried out of the garden; for, if thrown on the ground the former will re-ascend. But, if they are exceedingly numerous, all the young trees may even be lopped, especially if Mr. FORSYTH's plaster be applied to the wounds. Although by this operation, the fruit will be lost for that season, yet the tree will acquire considerable strength, and be in the finest order next year. Notwithstanding all these precautions, it will be necessary to examine the tree, with the utmost attention, towards the end of April, or beginning of May: for, at that season, the female vermin attain their full growth, so as to be easily perceptible; when each of them should be carefully detached from the branch to which it adheres, by means of a blunt knife with a very thin blade; then deposited in a vessel, and removed from the garden.

Naturalists have computed, that the generation of 3,000 insects will be prevented by the destruction of each female gall nut, so that great progress may be made in a very short time. Thus, if that necessary operation be performed with care, very few will escape; and if the eggs also be properly extirpated, all future trouble respecting this insect will be effectually obviated.

4. The *Coccus Phalaridis*, which is found on the *phalaris* or canary-grass

and is originally a native of the Canary Islands, but has become naturalised.

5 The *Coccus Cacti*, or cochineal insect, which is a native of the warmer parts of America. See COCHINEAL.

6. The *Coccus Ilicis*, or kermes, which inhabits a species of oak, called *Quercus coccifera*, and is a native of the southern parts of Europe. It is used in dyeing a deep red colour.

7 The *Coccus Lacca*, or gumlac animal, a native of the East Indies. See GUM-LAC.

8. The *Coccus Polonicus*, or scarlet grain of Poland, is found there in great abundance on the roots of the *polygonum cocciferum*. It is also called the *cochineal of the north*; as, contrary to the nature of the American insect, it thrives only in cold climates. It is collected for the use of dyers; though it yields not only smaller crops, and is gathered with more difficulty, but the drug also is much inferior to the true cochineal.

COCHINEAL, a drug used by dyers for imparting red colours, and also for the purpose of making *carmine*. It consists of an insect which is collected from the *cactus cochenillifer*, or, as it is differently called, *nopal*, or *nopalleca*, the Indian fig-tree; and is found most abundantly in the provinces of Oaxaca, Tlascala, and Chiapa, in South America. It is nourished solely by the juice of the plant on which it breeds, and which becomes converted into its substance, yielding a most beautiful scarlet and crimson colour.

The cochineal insects are usually gathered in the beginning of August, when they are killed, either by being immersed in hot water, or put into an oven moderately heated for that purpose; or, more advantageously, by being exposed to the scorching rays of the sun. The last mentioned method is reputed to be of superior efficacy for preserving the colouring property; and the cochineal thus treated, is of a shining silver grey. More than one million of pounds of this drug are annually imported into Europe. It is remarkable, that these worms may be kept in a dry state for more than a hundred years, without being in the least affected by the tooth of time.

The true Cochineal was found by the late industrious Dr. GARDEN, in South Carolina, and sent to England, to Mr. ELLIS. Mr RAPHAEL PEALE, of Philadelphia, also asserts, that he found it upon the island of Little St. Simons, on the coast of Georgia. The cultivation of this insect, and of the *Cactus Cochinellifer* plant ought to be encouraged by the southern planters, as a source of revenue, in case their crops of rice should fail, from vicissitudes in the season, or cotton, from frost or caterpillars. Spanish America derives an immense revenue from the cochineal, and from this circumstance, it is probable, that little trouble is requisite in the business of attending the insect.

[The *Cactus Opuntia* grows abundantly on all the calcareous islands near the American coast: so that if the cochineal insect were introduced from South America, we might supply all Europe with cochineal.—T. C.]

The following account of the Cochineal insect, taken from the 3d vol. of BINGLEY'S "Useful Knowledge," will be found interesting.

COCHINEAL is a scarlet dyeing drug which is chiefly imported from Mexico and New Spain, and is the production of a small hemipterous insect (*coccus cacti*) that is found on the prickly pear (*cactus opuntia*) and some other trees.

The male is winged, and the female not. The latter is of an oval form, convex on the back, and covered with a white downy substance resembling the finest cotton. The antennæ are half as long as the body, and the legs are short and black.

Cochineal is one of the most valuable substances that are used in dyeing. As imported into England it is in the form of a reddish shrivelled grain, covered with a white bloom or powder.

The cochineal insects adhere in great numbers, and in an apparently torpid state, to the leaves of the prickly pear. At a certain period of the year they are carefully picked or brushed off, either by a bamboo twig, shaped somewhat into the form of a pen, or by an instrument formed of a squirrel's or stag's tail. And so tedious is the operation that the persons employed in it are sometimes obliged to squat down for hours together beside a single plant. In some parts of South America the insects, after being collected in a wooden bowl, are thickly spread from thence upon a flat dish of earthenware, and cruelly placed alive over a charcoal fire, where they are slowly roasted, till their downy covering disappears, and they are perfectly dried In other parts they are killed by being thrown into boiling water, by being placed in ovens, or being exposed in heaps to the sun.

The quantity of cochineal annually exported from South America is said to be worth more than 500,000*l.* sterling;

a vast sum to arise from so minute an insect; and the present annual consumption of cochineal in England has been estimated at about 150,000 pounds weight.

It is for dyeing scarlet that cochineal is chiefly in demand: but although a peculiarly brilliant dye is now obtained from it, this substance gave only a dull crimson colour until a chemist of the name of KUSTER, who about the middle of the seventeenth century, lived at Bow, near London, discovered the art of preparing it with a solution of tin. Cochineal, if kept in a dry place, may be preserved without injury for a great length of time. An instance has been mentioned of some of this dye 130 years old having been found to produce the same effect as though it had been perfectly fresh.

The attention of the East India Company has for many years been directed to the production of cochineal in the East, but hitherto with little success. That which has been brought from India is very small, and greatly inferior to that imported from New Spain

Directions for taking care of the Cochineal Insects while at Sea.—Let a square case of stout plank be provided, four feet wide in the clear, and about fifteen inches deep; the whole framed and clinched so as to be water tight Within the top of this, a square plank of about three quarters of an inch thick must be fixed on a shoulder grooved on the side of the plank, in such a manner as that it cannot be dislodged by accident, but may be taken up to clear the space underneath.

In this covering plank four round holes must be cut sufficiently wide to let a garden pot of about ten inches diameter sink down to the rim, and rest upon it.

Over the top of this box, a slight wooden frame, about three feet high, or higher, if the size of the plants should require it, must be fixed to ship and unship, and in the sides of this frame two doors must be made in such manner, that by their means access may be had for the hand to every part of the inside whenever it may be necessary to do any thing either to the plants or insects on either side, and the whole of this frame and door must be neatly covered with gauze or wire work in such a manner that no insect, bred within, can escape, nor any one get admission from without.

This case should be fixed in the most airy and lightsome part of the cabin, where the spray of salt water cannot have access to it, and the care of it allotted to some one person whose business it should be, to water the plants when necessary, which as they are of a succulent nature, will seldom be the case; to keep the hollow below the pots sweet and clean and above all, to take care of the insects, carefully attending every day to kill every insect of a species different from the cochineal, which may be found within the case.

Four plants of the Indian fig with the cochineal insects upon them should be planted in four pots and placed in the holes within the case, and twenty spare plants at least, without the insects, planted in spare pots, of which each ship should have forty, and placed in the gallery or other convenient place, free from the spray of the sea, to be ready to supply the places of those in the frame, when the insects shall have sucked them dry by feeding upon them.

The principal care to be recommended to the person who has the charge of this business is, that the insects are by no means permitted to increase too much, one hundred mother insects, or even half that number, will be as valuable an acquisition to the settlements in India as a million, and too great an increase will, by devouring the plant, risk the loss of the whole. He should observe also that it is of the utmost importance that all the insects found in company with the cochineal be destroyed, in hopes that by these means the animals which feed upon the cochineal insects, and will certainly accompany it on board, may be extirpated before its arrival. The greatest attention, however, must be paid to the male cochineal which is a small fly distinguishable from all others by two long hairs proceeding from his rump; as his preservation is as necessary to the success of the undertaking as the destruction of the rest.

Particular care should be taken about the time that the insects are seven weeks old, to observe the first appearance of any young, when some of the biggest mothers should be collected and put into bags or purses of the fibrous web of the footstalk of the cocoa tree leaf, and attached to fresh plants on which the young as soon as they escape from the mother, may creep and form a new colony.

On ship-board, when cocoa leaves cannot be had, pieces of thin gauze or hair cloth, of a texture to confine the mothers, and at the same time, leave

room for the young to escape through its interstices, will be sufficient.

In want of any material, for such little bags, some branches, on which the young cochineal insects are beginning to issue from the mothers, may be cut off, and the branch placed so near a fresh plant, that the young may easily creep from the branch to the plant.

COCK, or *Gallus*, L. a species of the *phasianus*, too well known to require any description. The cock was first introduced into Europe from Persia, and is eminently distinguished for his courage, especially when opposed to one of his own species.

COCK-FIGHTING, the act or entertainment of setting game-cocks to fight, which, to the disgrace of England, holds a prominent rank among the amusements of the vulgar; and was till lately permitted in a sort of theatre, called the Royal Cock-pit, in Westminster. The Gentleman's Magazine for April, 1789, contains the following record: "Died, April 4th, at Tottenham, JOHN ARDESOIF, esq. a young man of large fortune, and in the splendour of his carriages and horses, rivalled by few country gentlemen. His table was that of hospitality; where it may be said he sacrificed too much to conviviality; but if he had his foibles, he had his merits also, that far outweighed them. Mr. ARDESOIF was very fond of cock-fighting; and possessed a favourite cock on which he had won many profitable matches. The last bet he laid upon this cock, he lost; which so enraged him, that he had the bird tied to a spit, and roasted alive before a large fire. The screams of the miserable animal were so affecting that some gentlemen, who were present, attempted to interfere, which so increased Mr. ARDESOIF's anger that he seized a poker, and with the most furious vehemence declared that he would kill the first man who interposed: but in the midst of his passionate asseverations, he fell down dead upon the spot. Such, we are assured, were the circumstances, that attended the death of this great pillar of humanity." Cock-fighting is a mixture of barbarity, and of that most disastrous of passions,—the passion of gaming.

COCOA-NUT. A woody fruit, of oval shape, from three or four to six or eight inches in length, covered with a fibrous husk, and lined internally with a white, firm, and fleshy kernel.

The tree (*Cocos nucifera*) which produces the cocoa-nut is a kind of palm, from forty to sixty feet high, having on its summit only leaves or branches, appearing almost like immense feathers, each fourteen or fifteen feet long, three feet broad, and winged. Of these the upper ones are erect, the middle ones horizontal, and the lower ones drooping. The trunk is straight, naked, and marked with the scars of the fallen leaves. The nuts hang from the summit of the tree, in clusters of a dozen or more together.

The external rind of the nuts has a smooth surface, and is of somewhat triangular shape. This incloses an extremely fibrous substance of considerable thickness, which immediately surrounds the nut. The latter has a thick and hard shell, with three holes at the base, each closed with a black membrane. The kernel lines the shell, is sometimes nearly an inch in thickness, and incloses a considerable quantity of sweet and watery liquid of whitish colour, which has the name of *milk*.

This tree is a native of Africa, the East and West Indies, and South America: and flourishing best in a sandy soil.

Food, clothing, and the means of shelter and protection, are all afforded by the cocoa-nut tree. The kernels of the *nuts*, which somewhat resemble the filbert in taste, but are of much firmer consistence, are used as food in various modes of dressing, and sometimes are cut into pieces and dried. When pressed in a mill they yield an oil which in some countries is the only oil used at table; and which, when fresh, is equal in quality to that of almonds. It however soon becomes rancid, and in this state is principally used by painters. The *milk* or fluid contained in the nuts is an exceedingly cool and agreeable beverage, which, when good, somewhat resembles the kernel in flavour.

Cocoa-nut trees first produce fruit when six or seven years old; after which each tree yields from fifty to a hundred nuts annually.

The fibrous coats or *husks* which envelope the cocoa nuts after having been soaked for some time in water, become soft. They are then beaten, to free them from the other substances with which they are intermixed, and which fall away like saw-dust, the stringy part only being left. This is spun into long yarns, woven into sail cloth, and twisted into ropes and cables, even for large vessels. The cordage thus ma-

nufactured is, in several respects, preferable to that brought from Europe, but particularly for the advantages which are derived from its floating in water. The woody *shells* of the nut are so hard as to receive a high polish, and are formed into drinking cups and other domestic utensils, which are sometimes expensively mounted in silver

On the summit of the cocoa-nut tree the tender *leaves*, at their first springing up, are folded over each other so as somewhat to resemble a cabbage. These are occasionally eaten in place of culinary greens, and are a very delicious food; but as they can only be obtained by the destruction of the tree, which dies in consequence of their being removed, they are in general considered too expensive a treat. The larger leaves are used for the thatching of buildings, and are wrought into baskets, brooms, mats, sacks, hammocks, and many other useful articles.

The *trunks* are made into boats, and constitute timber for the construction of houses; and, when their central pith is cleared away, they form excellent gutters for the conveyance of water. If, whilst growing, the body of the tree be bored, a white and sweetish liquor exudes from the wound, which has the name of *toddy*. This is collected in vessels of earthenware, and is a favourite beverage in many parts where the trees grow. When fresh it is very sweet; in a few hours it becomes somewhat acid, and in this state is peculiarly agreeable, but in the space of twenty-four hours it is complete vinegar. By distillation this liquor yields an ardent spirit, which is sometimes called *rack*, or *arrack;* and is more esteemed than that obtained by distillation from rice or sugar, and merely fermented and flavoured with the cocoa-nut juice. If boiled with quick lime it thickens into a syrup, which is used by confectioners in the East Indies, though it is much inferior to syrup produced from the sugar cane.

The milk of the cocoa-nut is used in the West Indies to allay vomiting in fever. It is given in doses of a table spoonful.

COD, the COMMON (*Gadus morhua,*) is distinguished by having three fins upon its back, a small fleshy beard on the under jaw, the tail fin nearly even at the extremity, and the first ray of the anal fin spinous.

The average weight of these fish is from ten to twenty or thirty pounds.

To the inhabitants of many countries, but more especially to those of our own, the cod fishery is a very essential source of wealth. It affords occupation to many thousand persons, and employment for several hundred sail of shipping. The fishery on the great bank near the island of Newfoundland is by far the most important of any that has hitherto been discovered in the world, and the resort of fish to this spot is beyond all imagination numerous. In the year 1791, there were caught more than 750,000,000 pounds' weight.

This immense bank is a vast mountain in the sea, more than 400 miles long, 1[illegible]0 miles broad, and in depth of water from twenty to sixty fathoms. It was first discovered in the reign of Henry VII.; and in 1543 an act of parliament was passed by which all Englishmen were permitted to traffic and fish on the coasts of Newfoundland and the adjacent banks, without payment of any duty. In 1583 Sir HUMPHREY GILBERT took possession of the Island of Newfoundland in the name of Queen ELIZABETH; and the first English company that associated to settle a colony there was incorporated by a patent of King JAMES I. in 1609.

The Newfoundland fishery at present gives freight to about 300 vessels, from 100 to 200 tons burthen each. These are chiefly fitted out from the islands of Guernsey and Jersey, from Ireland, and some ports of the English channel, as Pool, Dartmouth, &c. When these vessels arrive at the fishery, a kind of gallery is formed which reaches from the main-mast to the poop, and sometimes even from one end of the ship to the other. This is furnished with tuns st[illegible] at one end, into which the fishermen get to be sheltered from the weather, their heads being covered with a kind of roof [illegible] the top of the tun. The mode of fishing is by hook and line only; and the baits are herrings, a small fish called capelins, shell-fish, or pieces of sea-fowl. Each man can catch only one fish at a time; yet an expert fisherman has sometimes been known to take 400 in a day As soon as they are caught, the tongues are cut out, the heads cut off, and the liver, entrails, and spine. are all taken out. After this they are salted and piled for some time in the holds of the vessels, and then packed in barrels for sale, under the name of *green* or *wet cod.* When the fish are to be dried they are conveyed in boats to the

shore, where they are headed, cleansed, and salted upon stages or scaffolds erected for that purpose. They are subsequently spread on the shore to dry: these are called *dry cod*, and constitute the principal object of the Newfoundland trade. The chief markets to which the fish are conveyed are those of Spain, Portugal, Italy, and the Levant.

The most important fishing banks of Europe are in the neighbourhood of Iceland, Norway, and the Orkney Islands; and the Dogger-bank, and Wellbank, betwixt this country and Holland.

As the air-bladders of cod are thick and of a gelatinous nature, the Icelanders frequently make *isinglass* of them, similar to that which we usually import from Russia. By the Newfoundland fishermen the air-bladders are generally salted and packed in barrels under the name of *sounds;* and these, when good, are considered a great delicacy for the table. The *tongues* are prepared in the same manner and for the same purpose. From the *livers*, after they have become in a certain degree putrid, a kind of oil is obtained which is considered superior to whale oil, because it preserves leather longer flexible, and when clarified yields less vapour in burning than that. The *roes* are collected by the Icelanders, salted, packed in barrels, and sold to the Dutch, French, and Spaniards, as bait for anchovies and other fish. Before the commencement of the French revolution from 20,000 to 30,000 barrels of these roes were annually exported from Bergen. The inhabitants of some parts of Norway, when forage is scarce, dry the *heads* of cod, and mixing them with some species of seaweeds, give them as food to their cattle.

The London markets are abundantly supplied with fresh cod from the fishing banks adjacent to Great Britain. They are in season from the beginning of December till about the end of April; and are brought alive to the Thames in well-boats, the air-bladders being previously perforated with a pointed instrument to prevent the fish from rising in the water. Cod should be chosen for the table of middling size, plump about the shoulder and near the tail, the hollow behind the head deep, and with a regular undulated appearance on the sides, as if they were ribbed. The gills should be very red, the eyes fresh, and the flesh white and firm.

It is generally considered that the shoals of cod confine themselves between the latitudes 66° and 50° north. Those which are caught to the north or south of these degrees, are both few in quantity and bad in quality.

At the first discovery of the northern continent of America, few or no cod-fish were found to the southward of the banks of Newfoundland and Sable Island. About 50 years ago, they were first discovered off Sandy Hook, in the vicinity of New York. It has been observed, that ever since that time, they have gradually become more and more abundant on the fishing ground of the Neversink in 6, 7, and 8 fathoms water, and perhaps equally so many miles farther eastward. Some years since they appeared about the Capes of Delaware Bay, though in comparatively small quantities; and, it is said, that they have been caught on Chingoteague shoals in lat 38 on the coast of Maryland. From these facts, it seems probable that the cod-fish is gradually progressing southward, and in time may, perhaps, be caught along the whole extent of coast belonging to the United States. Hence we may conclude that they originally inhabited the banks of Newfoundland, whence, on account of their prodigious increase, they annually push out colonies in every direction, where sustenance can be procured.

CODE, a collection, or system, of laws. Justinian's code is distinguished by the appellation of *code*, in the way of eminence.

CODICIL, a writing, by way of supplement to a will, containing any thing which the testator wishes to add; or any explanation, alteration, or revocation. A codicil must be executed with the requisite formalities.

COFFEE is the seed of an evergreen shrub which is cultivated in hot climates, and is chiefly imported from Arabia and the East and West Indies.

This shrub (*Coffea Arabica*), is from fifteen to twenty feet in height. The leaves are four or five inches long, and two broad, smooth, green, and glossy on the upper surface, and the flowers, which grow in bunches at the base of the leaves, are white and sweet-scented. The berries or fruit are of a somewhat oval shape, about the size of a cherry, and of dark red colour when ripe. Each of these contains two cells, and each cell a single seed, which is the coffee as we see it before it undergoes the process of roasting.

Coffee is an article of only late introduction. To the Greeks and Romans it was wholly unknown. Its use appears to have originated in Ethiopia; and in 1554 it is stated to have been first introduced into Constantinople, from whence it was gradually adopted in the western parts of Europe. The information we have respecting it in England is, that in 1652 Daniel EDWARDS, a Turkey merchant, brought home with him a Greek servant, whose name was Pasqua, and who understood the method of roasting coffee, and making it into a beverage. This man was the first who publicly sold coffee in England, and kept a house for that purpose in George Yard, Lombard Street. At Paris coffee was nearly unknown until the arrival of the Turkish ambassador, Solomon Aga, in 1669; about three years after which the first coffee-house is said to have been established in that city. The coffee shrub was originally planted in Jamaica in 1732.

Great attention is paid to the culture of coffee in Arabia. The trees are raised from seed sown in nurseries, and afterwards planted out, in moist and shady situations, on sloping grounds, or at the foot of mountains. Care is taken to conduct little rills of water to the roots of the trees, which at certain seasons require to be constantly surrounded with moisture. As soon as the fruit is nearly ripe the water is turned off, lest the fruit should be rendered too succulent. In places much exposed to the south, the trees are planted in rows and are shaded from the otherwise too intense heat of the sun by a branching kind of poplar tree. When the fruit has attained its maturity cloths are placed under the trees, and upon these the labourers shake it down. They afterwards spread the berries on mats, and expose them to the sun to dry. The husk is then broken off by large and heavy rollers of wood or iron. When the coffee has been thus cleared of its husk, it is again dried in the sun, and lastly winnowed with a large fan, for the purpose of clearing it from the pieces of husks with which it is intermingled. A pound of coffee is generally more than the produce of one tree; but a tree in great vigour will produce three or four pounds.

The best coffee is imported from Mocha in the Red Sea. This, which in Europe is called *Mocha* and *Turkey coffee*, bears a higher price than any which our colonists are able to raise, owing, as it is supposed, to the difference of climate and soil in which it is grown. It is packed in large bales, each containing a number of smaller bales; and, when good, appears fresh, and of a greenish olive colour. The coffee next in esteem to this is grown in Java, and the East Indies; and that of lowest price in the West Indies. When stowed in ships with rum, pepper, or other articles, it is said that coffee contracts a rank and unpleasant flavour, and this has been assigned as a reason of the inferiority of that which is imported from the West Indies.

The quantity of coffee annually supplied by Arabia is supposed to be upwards of fourteen millions of pounds. Before the commencement of the French Revolution, the island of St. Domingo alone exported more than seventy millions of pounds per annum.

Almost all the Mahometans drink coffee at least twice a-day, very hot, and without sugar. The excellence of coffee depends, in a great measure, on the skill and attention that are exercised in the roasting of it. If it be too little roasted it is devoid of flavour, and if too much it becomes acrid, and has a disagreeble burnt taste. In England it is usually roasted in a cylindrical tin box, perforated with numerous holes, and fixed upon a spit which runs lengthwise through the centre, and is turned by a jack.

In a medical view coffee is said to be of use in assisting digestion, promoting the natural secretions, and preventing or removing a disposition to drowsiness. It has been found highly beneficial in relieving some cases of severe headach.

The outer pulpy part of the berry and the inner membrane, which immediately invests the seeds, are used by the Arabians; and of these the former is much esteemed, and constitutes the *coffee à la sultane*.

There are three principal sorts of this drug known in commerce: 1. The Arabian, or Mocha coffee, imported from the Levant; and which, on account of its superior flavour, is the most esteemed; 2. The East Indian; and, 3. The West Indian coffee of the French, English, and Dutch settlements: among the latter sorts that of Martinico is generally preferred.

To obviate the unpleasant flavour which coffee contracts by being stowed in ships with rum, pepper, or any other

article possessing a peculiar smell, the berries ought to be well dried in the sun, before they are shipped in separate vessels, or properly secured, if they are imported together with other merchandise. But, when they have once acquired a disagreeable flavour, it will be necessary to pour boiling water over them, and afterwards to dry them completely in the open air, previously to their being roasted. The colour of a *watery infusion*, may also serve as a tolerable test for ascertaining the quality of coffee, for if cold water, after standing for several hours over the raw berries, acquire a deep citron colour, we may conclude that the coffee has not been damaged, or adulterated.

Since the introduction of coffee into Europe, in the 16th century, various substitutes have been devised for this drug; [of which the root of the Chicorium intubus, wild endive, or succory, is the best. Coffee trees will not succeed north of 28° 30'—T. C.]

Carey's Coffee Simmerer.—Have a straight sided pot, of equal width, top and bottom, and inclosed in a case of similar shape, one inch and a quarter wider and one inch deeper than the pot, and to which the latter must be soldered at the top, so as to be perfectly air tight, while it is left completely open round and underneath the pot. The lid should be double, and the vessel furnished of course with a convenient handle and spout

Into this vessel put the water, cold if not wanted for speedy use; or hot, (but not boiling) if immediately wanted: and then put in the powdered coffee; stopping the spout with a cork, and closing the lid tight; place the vessel about an inch and three quarters above a lamp, where it will soon begin to simmer, and may remain unmolested until wanted for use, then strain it through a bag of stout close linen, in the following manner: tie the strainer round the mouth of an open cylinder or tube, which is fitted into the mouth of the coffee-pot that is to receive the fluid, and if the coffee-pot have a cock near the bottom, the liquid may be drawn out as fast and as hot as it passes from the strainer.

If the coffee be not intended for speedy use, it may be placed at night over the lamp and left to simmer till wanted the next day The lamp may be a common tin lamp of the shops, but the oil used, should be pure sper[illegible]

One material advantage arising from this mode is, that a smaller quantity of the powdered coffee is required, it must be ground fine, for in the common method, much of the essence of the plant is lost, on account of its being ground coarse. The finer it is ground, the less quantity is required. Coffee made in this way never boils over nor loses by evaporation; needs no attention, saves fuel, and is *of a peculiar fine flavour*

COFFIN, the chest in which a dead body is usually put for interment The sepulchral honours paid to departed friends in ancient times are extremely curious. Their being put into a coffin was with them considered as a mark of the highest distinction; though with us the poorest people have their coffins. At this day, in the East, they are not at all made use of; and Turks and Christians, as THEVENOT assures us, agree in this. The ancient Jews seem to have buried their dead in the same manner; neither was the body of Christ, it should seem, put into a coffin; nor that of Elisha (2 Kings, xiii. 21) whose bones were touched by the corpse that was let down a little after into his sepulchre. However, that coffins were anciently made use of in Egypt all agree, since antique coffins of stone and sycamore wood are still to be seen in that country; not to mention those said to be made of a kind of pasteboard, formed by folding or glueing cloth together a great many times, curiously plastered, and then painted with hieroglyphics It being an ancient Egyptian custom, and not practised in the neighbouring countries, was doubtless the cause that the sacred historian expressly observes of JOSEPH, that he was not only embalmed, but put into a coffin too: both being customs that were peculiar to the Egyptians

We have, among other ingenious inventions, patent coffins, which effectually preclude the depredations of those that obtain a livelihood by robbing cemeteries. The security of this contrivance arises chiefly from making the coffin so very strong as to resist the instruments usually employed by what are termed "resurrection men," and by making the lid to fit on with spring plugs, fitting into hitched sockets; so that being once closed they never can be severed, except by breaking the coffin to pieces

COHESION, in natural philosophy, as distinguished from adhesion, is that species of attraction which, uniting

particle to particle, retains together the component parts of the same mass. Whatever the cause of cohesion may be, its effects are evident and certain. The different degrees of it constitute bodies of different forms and properties. Thus NEWTON observes, the particles of fluids which do not cohere too strongly, and are small enough to render them susceptible of those agitations which keep liquors in a fluid state, are most easily separated and rarefied into vapour, and make what the chemists call volatile bodies; being rarefied with an easy heat, and again condensed with a moderate cold. Those that have grosser particles, and so are less susceptible of agitation, or cohere by a stronger attraction, are not separable without a greater degree of heat, and some of them not without decomposition

Modern Chemists have agreed to consider the attraction of cohesion as the instrument of aggregation, or the union of similar compounds, and are careful not to confound it with the elective attractions, though there may in strictness be no difference between them. In estimating the absolute cohesion of solid pieces of bodies, MUSCHENBROEK applied weights to separate them according to their lengths; his pieces of wood were long square parallelopipedons, each side of which was the 26th of an inch, and they were drawn asunder by the following weights:

	lbs.
Fir	600
Elm	950
Alder	1000
Linden	1000
Oak	1150
Beech	1250
Ash	1250

He tried also wires of metal 1-10th of a Rhinland inch in diameter, the metals and weights are as follows:

	lbs.
Lead	29¼
Tin	40¼
Copper	299¼
Yellow Brass	360
Silver	370
Iron	450
Gold	500

COIN, money stamped with a legal impression. Strictly speaking, coin differs from money as the species differ from the genus. Money is any matter, whether metal, or paper, or beads, or shells, &c which have currency as a medium in commerce. Coin is a particular species, always made of metal, and struck according to a certain process called coining.

A TABLE of various Foreign Coins, &c. with their value in Federal Money, as established by an Act of Congress.

	E.	D.	d.	c.	m.
Pound Sterling	0	4	4	4	0
Pound of Ireland	0	4	1	0	0
Pagoda of India	0	1	9	4	0
Tale of China	0	1	4	8	0
Mill-ree of Portugal	0	1	2	4	0
Ruble of Russia	0	0	6	6	0
Rupee of Bengal	0	0	5	5	5
The Guilder of the United Netherlands	0	0	3	9	0
Mark Banco of Hamburg	0	[illegible]	3	[illegible]	5
Livre Tournois of France	0	0	1	8	5
Real Plate of Spain	0	0	1	0	0

The Different Weights of the Federal Coins.

	Pure Gold.			Standard do.		
	dwts.	*grs.*		*dwts.*	*grs.*	
An Eagle	10	7	4-8	11	6	
Half do.	5	3	5-8	5	15	
Qr. do.	2	13	7-8	2	19	4-8
	Pure Silver.			Standard do.		
Dollars	15	11	4-16	17	8	
Half do.	7	17	10 16	8	16	
Quarter do.	3	20	13-16	4	8	
Dimes	1	13	2-16	1	17	3-5
Half do.	0	18	9-16		20	4-5
	Copper.					
Cents	8	16				
Half do.	4	8				

The standard for silver coins 1438 parts of pure silver, to 179 parts of alloy, which is to be wholly of copper, or 11 and 1.

All other gold coin of equal fineness, to be valued at 89 cents per dwt. and all other silver coin of the same fineness at 111 cents per oz.

A mill is the lowest money of account—one thousand being equal to the Federal dollar, unit 0,001 A cent is the highest copper coin, one hundred being equal to a dollar 0,01.

A TABLE

gl an Value of Coi s, as ey pass in the spective Stat e Union, with thei Sterl g and Federal alue.

NAMES OF COINS	Standard Weight.		Sterling Money of Great Britain			N' Hampshire, Massachusetts, Rhode Island, Connecticut, & Virginia.			New York and North Carolina.			New Jersey, Pennsylvania, Delawar and Maryland			South Carolina and Georgia.			Federal Value				
																		Eag's.	Dolls.	Dimes.	Cents	Mills.
(GOLD	dwt.	gr.	L	s.	d													E.	D.	d.	c.	m.
A Johannes	18	0	3	12		4	16	0	6	8		6	0	0	4	0	0	1	6	0	0	0
A Half Johannes	9	0	1	16		2	8	0	3	4		3	0	0	2	0	0		8	0	0	0
A Doubloon	16	21	3	6		4	8	0	5	16		5	12	6	3	10	0	1	4	9	3	3
A Moidore	6	18	1	7		1	16	0	2	8		2	5	0	1	8	0		6	0	0	0
An English Guinea	5	6	1	1		1	8	0	1	17		1	15	0	1	1	9		4	6	6	7
A French Guinea	5	5	1	1		1	7	6	1	16	0	1	14	6	1	1	5		4	6	0	0
A Spanish Pistole	4	6	0	16		1	2	0	1	9	0	1	8	0	0	18	0		3	7	7	3
A French Pistole	4	4	0	16		1	2	0	1	8	0	1	7	6	0	17	6		3	6	6	7
(SILVER																						
An English or French Crown	19	0				0	6	8	0	8	9		8	3	0	5	0		1	1	0	0
The Dollar of Spain, Sweden or Denmark	17	6	0	4	0	0	6	0	0	8	0		7	6	0	4	8		1	0	0	0
An English Shilling	3	18	0	1	0	0	1	4	0	1	9		1	8	0	1	0		0	2	2	2
A Pistareen	3	11	0	0	10	0	1	2	0	1	7		1	6	0	0	11		0	2	0	0

The following are the coins and exchanges of the principal kingdoms and states.

Great Britain. Accounts are kept in pounds, shillings, pence, and farthings. One pound is equal to 20 shillings, one shilling to 12 pence or pennies, one penny to 4 farthings. The coins of gold are, the guinea, equal to 1l. 1s. half-guinea to 10s. 6d. and pieces of 7s.—Of silver, the crown, equal to 5s half-crown, equal to 2s. 6d shillings to 12 pence, six-pence to 6d.; of copper, two-pennies, pennies, half-pennies and far-

things. For the course of exchange between Great Britain and other countries, see those countries.

Ascheen, in the island of Sumatra.—Accounts are kept in tayels, padarves, and masses. One tayel equal 4 padarves, and one padarve equal 4 masses. The mass is most current money, and is of gold, and worth about 15d. three farthings, English.

Aleppo, *Alexandretto*, and *Sanderoon*. Accounts are kept in piastres of eighty aspers, see Turkey.—The same coins pass here as in Turkey.

Alexandria, in Egypt, and *Cairo*. Accounts are kept in piastres or dollars, of thirty medinas, each dollar worth 4s. 6d sterling. The real money is the ducat of 24 medinas. A medina is worth three aspers of Turkey. The purse contains 75,000 aspers.

Alicant, in Spain. Accounts are kept in libras or pessos, equal 20 sueldos, sueldos equal 12 dineros; also by rials of 24 dineros. A libra is equal to 5s. 7d. halfpenny sterling.

United States of *America*. Accounts in America are kept in dollars, dismes, and cents. One dollar is worth 4s. 6d. sterling. One dollar equal 10 dismes; one disme equal 10 cents. The coins of Britain, France, Spain and Portugal, are current here, though the American States have issued coin of their own: eagles, half-eagles, dollars, half dollars, and cents and half cents.

Amsterdam and the *Province of Holland*. Accounts kept in florins or guelders, stuivers or skillings, and deniers or pennings. One florin equal 20 stuivers, and one stuiver equal 16 pennings. The gross pound is worth 6 florins or guelders. The current coins of Holland are rixdollars, worth about 4s 6d. sterling, guelders or florins, 1s. 9d. skillings 6d. 3-tenths, these are of silver; stuiver of copper 1 penny 1-twentieth, the grote the fourth part of a stuiver, the duyt the half a grote, and the penning half a duyt. There are also ducats of Holland, worth 1l. 16s. ster. and silver ducatoons worth 5s 8d. The exchange between England is by shillings and skillings, 20 English shillings being worth about 37 Dutch skillings.

Ancona. Accounts are kept in scudi of 20 soldi, and soldi of 12 denari; and also by paoli, 10 of which make a scudo. The coins of Rome are current here.

Barcelona, in Spain. Accounts are kept in libras or catalan pounds of 20 sculdos, each sculdo of 12 dineros. A catalan pound is worth about 5s. 7d. sterling. England has no exchange on Barcelona.

Bassora. Accounts are kept in mamoudis of 10 danimes, danimes of 10 flouches, taman of 100 mamoudis. Coins current, of gold, are the sequin of Cairo, equal 13 mamoudis, 5 danimes; sequin gengirly equal 15 mamoudis; of silver, mamoudi, worth 8*d*. sterling, abassi (old) equal two mamoudis, abassi, (new) equal 2 mamoudis, 2 danimes. Of copper, danime.

Batavia. Accounts are kept in piastres or dollars of 63 stuivers each. The real money current here are the Spanish dollar, and the ecu of France and Holland.

Bengal. Accounts are kept in rupees of 16 annas. One anna equal 12 pieces. A crore is 100 lacs, a lac 100,000 rupees. Rupees are of various kinds. Rupee sicca, a Mogul coin, worth about 24 and an half Dutch stuivers, or 2*s*. 6*d*. ster. Bombay rupee about 3 per cent. worse than the sicca. Arcot rupee about 6 per cent, worse than the sicca.

Berlin. In this city, Magdebourg, Francfort on the Oder, and other places in the electorate of Brandenburgh, they reckon by thalers of 24 gutegrosches. One gutegrosche equal 12 pfenings. The coins of the kingdom of Prussia are, of gold, the Frederic of 5 thalers, value 17*s* 6*d*. sterling, the ducat of 2 three-fourths thalers, value 9*s* 4*d* ster. Of silver; the thaler of 24 gutegrosches, value 3*s* 6*d*. ster. Of copper; pieces of 3 and of 1 pfening.

Bologna, in Italy. Accounts are kept in lira of 20 soldi, soldi of 12 denari. The lira is 1*s*. English. The coins of Bologna are, pistoles, 15*s*. 6*d*. crown, 5*s*., ducatoons, 5*s*. 3*d*. scudi, 4*s*. 3*d*. testoons, 1*s*. 6*d*.

Bombay. Accounts are kept as in England, or by rupees. The coins current in Bombay are, rupees of silver worth about 2*s*. 3*d*. rupees of copper worth about 1*d* and 1-6th, mohur of gold worth 12 and an half rupees of silver. Pagodas worth 8*s*. sterling.

China. Accounts are kept in lyangs or tayels of 10 mass, mass of 10 candareen, candareen of 10 cass. The lyang or tayel of silver is worth 3 florins, 14 stuivers of Holland, or 6*s* 8*d*. sterling. Mass 8*d*. Candareen, 4 8ths of a penny.

Cologne. Accounts are kept in thaler of 80 albus coulan, albus of 12 hellers. The coins are, of silver, 1 thaler or rixdollar 4*s*. 8*d* 1 guelder 2*s* 4*d*. 1 copstruck 8*d* 2-3ds, 1 pl. phert 2*d*. 1-10th. Of copper, 1 stuyver equal 7-10ths of a penny.

Dantzic. Accounts are kept in guelders or florins of 30 groschens. The coins are, of gold, the Frederic, worth about 17s. 6d the ducat, worth about 8 florins or 9s. 4d Silver, ryksdalers of 3 florins, or 3s. 6d.

Denmark Accounts are kept in ryksdalers or rix dollars of 6 marks, marks of 6 Danish skillings, skillings of 8 stuivers.—The coins current in Denmark are, gold, the ducat of 11 marks or 8s. 3d. Silver, the ryksdaler of 6 marks or 4s. 6d. crown of 4 marks or 3s.

Flanders and *Brabant.* Accounts are kept in pounds Flemish of 20 schellings, schellings of 12 groots, or by florings or guelders of 20 stuivers, and stuivers of 12 pennings The coins current in Flanders are, gold, ducat worth 9s. 3d. sterling;—silver, schelling worth 6d. 7-10ths.

France Accounts were formerly kept in livres, sous, and deniers tournois.—One livre was equal to 20 sous, and one sous worth 12 deniers; the livre was nearly equal to 10d. sterling. The exchange between Great Britain and France was carried on by a fictitious money, called an ecu of 3 livres, which, when exchange was at par, was worth about 2s. 6d The coins of France were, of gold, the double louis-d'or of 48 livres, single louis-d'or 24 livres, half louis-d'or 12 livres;—of silver, ecu of 6 livres, half ecu, equal to an ecu of exchange, 3 livres: there were also coins of the fifth, the tenth, and the twentieth of an ecu; of bellen, or brass pieces of two sous, one sou and half-sou;—of copper, the double liard worth half a sous, and the liard worth 3 deniers.—The coinage of the republic was regulated by its new metrical system. The lowest denomination, or unit, of coin, called a franc, is a silver piece of five grammes, containing 1-10th alloy, and 9-10ths pure silver, and is worth 1 livre and three deniers tournois. The proportion of the new money to the old, is as 81 to 80. It is divided into decimes and centimes. The gold coin, like the silver, has 1-10th alloy. An hectogramme of gold is worth 25 francs.

Francfort. Accounts are kept in rixdollars of 90 kreutzers and kreutzers of 4 pfennings.—The coins are, the gold ducat of 2 rixdollars and 60 kreutzers, or 9s. 4d.—Silver, dollar of 120 kreutzer, or 4s. 8d.

Geneva. Accounts are kept in livers of 20 sols, sols of 12 dence.—A livre is equal to 1s 3d. sterling. The coins are ducat, worth 2s. sterl. croisade, worth 5s. 10d. sterling.

Genoa. Accounts are kept in lire of 20 soldi, soldi of 12 denars.—The coins are, of gold, pistole value 20 lire or 14s. 4d. sterling—Of silver, gensen 6s. 2d testoon 1s. cavelot 1d $\frac{18}{23}$—Of copper, soldi $\frac{43}{100}$

Hamburgh. Accounts are kept in marks of sixteen skillings-lubs, skilling of 12 pfennings.—The ryksdaller is 3 marks, dollar of exchange is 2 marks. The coins of Hamburgh are, of gold, ducat worth 7 marks or 18s 6d—Silver rix-dollar, three marks, or 4s. 6d. thaler 2 marks, or 3s mark 1s. 6d.

Hanover. Accounts are kept in dollars of 24 mariengroshen, of 12 pfennings. each The coins are the ducat 9s. 2d guelder 2-thirds of a dollar 2s 4d grosh 1d. three farthings

Ireland. In Ireland, before the union, accounts were kept in pounds, shillings and pence, as in Britain, and the British coins were current, but at different rates, viz. a guinea passed for 22s 9d. Irish, half-guinea for 11s 4d half penny, shilling for 1s. 1d sixpence for 6d. halfpenny; that is, one hundred pounds sterling were equal to 108l 6s. 8d. Irish.

Leghorn Accounts are kept in lire or pezzos of 20 soldi of 12 denari.—The coins are, pistole of 22 lire or pezzos 15s 6d ducat of 7 and an half lire or pezzos 5s 2d half-penny, piastre of exchange 6 pezzos 4s. 2d

Leipsic Accounts are kept by thalers of 24 gutegroschen, gutegroschen of 12 pfenning.—A ryksdaler is worth 1 and an half thalers The coins are, the ducat of two dollars specie, 9s 4d dollar 4s 8d. gered or thaler 2s 4d—The dollar of specie is worth two thirds of dollar of accounts.

Naples Accounts are kept in ducats of 10 carlin, carlin of 10 grain—The coins are, of gold, the pistole value 15s. 4d. sterl—Of silver, ducat, 3s 4d testoon, 1s 4d tarin, 8d. paul, 6d carlin, 4d.—Of copper, grain, 2-5ths, quatrin, 2-15ths.

Portugal. Accounts are kept here in the most simple manner imaginable: in reas, of which 1,000 are worth 5s. 6d sterling—Coins, Gold, moidore equal 48,000 reas, or 1l 7s. sterling, pataque equal 600 reas, or 3s 4½d—Silver, equal 400 reas, or 2s. 3d. testoon equal 100 reas, or 6¾d.—Copper, ventin equal 20 reas, or 1d 7 20, rea equal 27-400 of a penny.

Rome. Accounts are kept in scudi of 10 paoli, paoli of 10 bojechi.—The coins are, of gold, the pistole, value 15s sterling, sequin value 9s—Of silver, the crown or piastre, value 5s. or 10

paoli, testoon 1s 6d julio 6d.—Of copper, bayoc three-farthings, quatrin 3-16.

Russia. Accounts are kept in roubles of 100 copeeks.—The coins are, the ducat 9s rouble 4s 6d. poltina 2s. 1d. grevina 5d 1-5th, copeek 27-10ths of a penny.

Savoy. Accounts are kept in lire of 20 soldi, soldi of 20 denari.—A lire is worth 1s 3d—The coins are, of gold, pistole of 18 lire, value 16s 3d—Of silver, ducatoon 5s. 3d. crown 4s. 6d lire 1s. 3d florin 9d sol, three farthings.—Of copper, quatrin 2-16ths.

Sicily. Accounts are kept in onze of 30 tari, tari of 20 grani. The onze is worth 7s. 8d. sterling.—The coins are, of gold, the pistole 16s. 4d—Of silver, the ducat 3s 4d. florin 1s 6d. 5-15ths, tarin 3d 1-13th, carlin 1d. 7-13ths.—Of copper, ponti 8-38ths.

Spain Accounts are kept in Spain various ways, but always in rials, of which there are four sorts. The rial vellon of 8 1-8th quartos of 34 maravedis of vellon; this is used in the interior commerce, and is the 20th part of a dollar, or 2d 7 8ths sterling.—The rial of plate, provincial, of 17 quartos or 34 maravedis, and is sometimes called the rial of new plate, is just double the value of the other, 5d 3-8ths.—The rial of old plate of 10 quartos and 32 maravedis, 8 of which equal a dollar, 6¾d. sterling—The rial of Mexican plate of 21-4 quartos, 34 maravedis Cellon, 8 of which rials make a dollar.—The coins of Spain, are the pistole of gold worth about 16s 2d sterling, the dollar 3s. 7d the old Seville or Mexican dollar worth about 4s. 6d

Turkey. Accounts are kept in piastres or dollars of 10 mina or aspers—The dollar is equal to 4s sterl—The coins are, the xeriff, worth 10s. sterling, caragrouch 5s seloto 1s. ostic 6d. asper 3 5ths of a penny

Venice. Accounts are kept in ducats of 24 grossi, grossi of 12 denare, or in leri, soldi, and denari—The ducat-current is worth 3s 5d sterl.—A ducat of exchange is 4s 4d sterl—The coins are, of gold, sequin at 9s. 2d—Of silver, ducat 3s. 5d testoon 1s 6d julio 6d grossi 1½d.—Of copper, soldi, 1-3d.

Vienna Accounts are kept in florins or guelders of 61 kreutzers, kreutzers of 4 pfenings.—The florin is equal to 2s. 4d. sterl.—The coins are, the ducat of 4 florins, value 9s. 4d dollar 4s. 6d. kreutzer 7 15ths of a penny.

A method of taking off casts from coins.—On account of the great value of antique coins, and the difficulty with which they are obtained, few persons have it in their power to procure a complete series. We therefore communicate the following mode, by which that desirable object may be obtained, and the industrious antiquary enabled to ascertain many disputed points in history.

The method of taking off impressions, by means of Plaster of Paris and sulphur, is well known; but as the former is too soft, and the latter too brittle, they can be preserved only for a short period. This difficulty may be obviated by laying a coat of the finest tin-foil over the medal intended to be taken off, and rubbing it gently with a brush, till it has received a perfect impression, when the edge of it should be pared, so as to render it of the same circumference. The medal should then be reversed, when the tin-foil will fall into a mould ready to receive it, the concave side being uppermost. Plaster of Paris may be poured upon this, in the usual manner; and, when dry, the cast figure should be taken out, with the tin-foil adhering to it; the convex side being uppermost. In this position, it should be kept in the cabinet; and if it receive no external injury, will endure for ages.

COINAGE is the art of making money; and used formerly to be made with a hammer or mill. There were three machines chiefly in use, viz. the laminating engine:—the machine for making impressions on the edge of the coins, and the mill. The metal is first reduced to its proper thickness by the laminating engine, out of each lamina is cut as many pieces or planchets as it can contain: these then are brought to the machine that marks them on the edge, and when that operation is performed, they are taken to the mill to have the two faces stamped. The machinery now used in England was invented by Messrs. Boulton and Watt; it works the screw presses for cutting out the circular pieces of copper, and coins both the edges and faces at the same time, with such superior excellence and cheapness of workmanship as will prevent clandestine imitations. By this machinery, worked with a steam engine and four boys, 30,000 pieces can be coined in an hour, and the machine acts at the same time as a register, and keeps an accurate account of the number of pieces struck.

Dr. ERICK BOLLMAN's proposal to substitute PLATINA TOKENS, submitted to the governor and directors of the bank

of England, on June 19th, 1815, has so much novelty and ingenuity, that I insert it.

"The Bank of England, for reasons well known, has found it expedient to issue bank tokens of silver, which have proved a great accommodation, and convenience to the public.

The commercial value of these tokens, as metal, is inferior to their representative value.

They are therefore metallic bank notes.

They might have been struck of copper, or any other inferior metal: but in this case the difference between their commercial and representative value would have been so great as to hold out an extraordinary temptation for forging them at home, as well as abroad.

The adopted difference between the representative and commercial value of the tokens of silver, at the present average rate of the foreign exchanges, is large enough to prevent the tokens from being melted down, and exported as bullion, and yet not so large as to hold out a very great temptation for coining them clandestinely.

But the specific gravity of silver not being very different from that of some other metals, and chiefly from that of copper, great temptation still exists to strike them of an inferior metal plated, and many counterfeits of this description are actually in circulation.

Bank tokens of platina would be superior to bank tokens of silver for the following reasons:

1. As platina cannot be melted, and as small pieces, such as tokens would be, cannot by other means, be brought into larger solid masses, fit for the arts, without a process little known, and moreover *laborious* and *expensive, pieces once coined, would always retain that* [illegible]. Their representative value might therefore be rendered equal to their commercial value, and thus the odium attached to the contrary proceeding, be avoided, and yet they would remain in the country. They might even be considered as more permanently domestic than the present tokens of silver, since a state of the foreign exchanges is at least conceivable, though not very likely to take place, which would render it profitable to melt them down, and export them as bullion.

2. Platina having about double the specific gravity of silver and copper, and being even heavier than gold, counterfeits are quite impracticable, since it would be impossible for them to escape immediate detection.

3. Platina being of an extraordinary density, and toughness, it is less apt to wear than any other metal whatever. The tokens therefore would probably preserve their impression through a lapse of ages unimpaired.

4. The commercial value of platina being much greater than that of silver, ten shilling, and fifteen shilling pieces might be struck of it of a very convenient size. Three and four shilling pieces would not be larger than guineas, and would also on that account be preferable to tokens of silver.

5. Silver ore is so abundant, particularly in South America, that the commercial value of this metal must lessen considerably, as soon as an improved method of working the mines, and the ore, shall have been introduced into that part of the world, an event probably not very distant. The ore of platina on the other hand is so very scarce, that there certainly exists a greater probability of an increase of its commercial value, in proportion as new employments occur, than of a diminution.

These several arguments in favour of bank tokens of platina will be allowed to have much weight, and they cannot be controverted.

The scarcity of the metal seems an objection, yet the value of 200,000*l.* sterling, might be furnished annually, and the country would thus become gradually, and what is most essential, permanently stocked, with this most indestructible, most safe, and most convenient medium of circulation.

The gradual introduction of the platina tokens would not put the bank to any new and extraordinary expense, since silver tokens, to the same amount, might be withdrawn from circulation, so as simply to replace the one with the other.

In addition to the preceding arguments for the introduction of tokens of platina, which regard chiefly the immediate interests of the bank and of the public, another, of a political nature, may be mentioned in support of the same idea.

Great Britain producing no silver, she is obliged to purchase all she uses, The entire capital therefore, invested in tokens, is so much abstracted from the productive capital of the country.

No more does Great Britain produce platina; but platina is purchased abroad, in the state of ore, and the tokens must be coined of the malleable metal, which is of a very superior value. Of course the *whole* sum invested in tokens of platina is not abstracted from the produc-

tive capital of the nation, but only that *portion* of it which goes abroad to pay for the ore. The remainder compensates value created at home by ingenuity and labour, stimulates industry, remains in circulation among her own people, and continues part of their productive stock.

Perhaps, too, the introduction of tokens of platina may be considered as a preparatory step to making, at some future period, platina coin the legal coin of the country,—a measure which, on a thorough investigation, will probably be found an important step towards the attainment of greater perfection in this branch of political economy.

In the United States, where the question is not the replacement of silver tokens, already in use, by tokens of platina, but the substitution of these for most inconvenient notes for one dollar, and downwards, all the arguments stated in the preceding paper, will apply with double force. The public, in every respect, would gain by the arrangement. The least notes, issued by the national bank, should be of five dollars; and for the small circulation tokens of platina should be issued for $2½, and for $1. For tokens for the fractions of dollars, an alloy of copper and platina would answer, which, properly made, produces a metal of a reddish gold colour, heavy fine grained, not tarnishing in the air, and possessing many of the advantages of tokens of pure platina.—E B."

COLD, in a relative sense, signifies the sensation which accompanies a transition of the fine vessels of the human body from an expanded to a more contracted state. In an absolute sense, it signifies the cause of that transition; or, in general, the cause of the contraction of every substance, whether solid or fluid, in nature. Great degrees of cold are produced by mixing together substances which dissolve rapidly. The reason of this will appear when it is recollected that in the conversion of solid bodies into fluids caloric is always absorbed. Mixtures to produce artificial cold are generally made of neutral SALTS (which see) and of snow: or of neutral salts, diluted acids, and powdered ice or fine flaky snow The following tables given to the public by Mr. RICHARD WALKER of Oxford will exhibit at once all that is important on this subject.

In order to produce these effects, the salts employed must be fresh chrystallised, and newly reduced to very fine powder. The vessels in which the freezing mixture is made should be very thin, and just large enough to hold it, and the materials should be mixed together as quickly as possible. To produce the very low degrees of cold, the materials in the first column are to be cooled previously to mixing, to the temperature required, by mixtures taken from either of the following tables. This observation chiefly applies to the third table.

TABLE I.—This table cousists of FRIGORIFIC MIXTURES, which are sufficient for all useful and philosophical purposes, in any part of the world, at any season

MIXTURES.	parts	Thermometer sinks	degrees of cold.
Muriate of ammonia Nitrate of potash Water	5 5 16	From +50° to +10°	40
Muriate of ammonia Nitrate of potash Sulphate of soda Water	5 5 8 16	From +50° to 4°	46
Nitrate of ammonia Water	1 1	From +50° to +4°	46
Nitrate of ammonia Carbonate of Soda Water	1 1 1	From +50° to —7°	57
Sulphate of soda Diluted nitric acid	3 2	From +50° to —3°	53
Sulphate of soda Muriate of ammonia Nitrate of potash Diluted nitric acid	6 4 2 4	From +50° to —10°	60
Sulphate of soda Nitrate of ammonia Diluted nitric acid	6 5 4	From +50° to —14°	64
Phosphate of soda Diluted nitric acid	9 4	From +50° to —12°	62
Phosphate of soda Nitrate of ammonia Diluted nitric acid	9 6 4	From +50° to —21°	71
Sulphate of soda Muriatic acid	8 5	From +50° to 0°	50
Sulphate of soda Diluted sulphuric acid	5 4	From +50° to +3°	47

TABLE II.—This Table consists of FRIGORIFIC MIXTURES, composed of *ice*, with chemical salts and acids.

FRIGORIFIC MIXTURES, *with Ice.*

MIXTURES.	parts	Thermometer sinks.	degrees of cold
Snow or pounded ice Muriate of soda	2 1	From any Temperature to—5°	—
Snow, or pounded ice Muriate of soda Muriate of ammonia	5 2 1	to—12°	—
Snow or pounded ice Muriate of soda Muriate of ammonia Nitrate of potash	24 10 5 5	to—18°	—
Snow, or pounded ice Muriate of soda Nitrate of ammonia	12 5 5	to—25°	—
Snow . . . . . . Diluted sulphuric acid	3 2	From+32° to—23°	55
Snow . . . . . Muriatic acid	8 5	From+32° to—27°	59
Snow . . . . Diluted nitric acid	7 4	From+32 to—30°	62
Snow . . . . . . Muriate of lime	4 5	From+32° to—40°	72
Snow . . . . . . Christ muriate of lime	2 3	From+32° to—50°	82
Snow . . . . . . potash	3 4	From+32° to—51°	83

TABLE III.—This Table consists of FRIGORIFIC MIXTURES, selected from the foregoing tables, and *combined*, so as to *increase* or *extend* cold to the extremest degrees.

Combinations of FRIGORIFIC MIXTURES.

MIXTURES.	parts	Thermometer sinks.	degrees of cold.
Phosphate of soda Nitrate of ammonia Diluted nitric acid	5 3 4	From 0° to—34°.	34
Phosphate of soda Nitrate of ammonia Diluted nitric acid	3 2 4	From—34° to—50°	16
Snow . . . . . . Diluted nitric acid	3 2	From 0° to—46°	46
Snow . . . . . . Diluted sulphuric acid Diluted nitric acid	8 3 3	From—10° to—56°	46
Snow . . . . . Diluted sulphuric acid	1 1	From—20° to—60°	40
Snow . . . . . . Muriate of lime	3 4	From+20° to—48°	68
Snow . . . . . . Muriate of lime	3 4	From+10° to—54°	64
Snow . . . . . . Muriate of lime	2 3	From—15° to—68°	53
Snow . . . . . . Chryst. muriate of lime	1 2	From 0° to—66°	66
Snow . . . . . . Chryst. muriate of lime	1 3	From—40° to—73°	33
Snow . . . . . Diluted sulphuric acid	8 10	From—68° to—91°	23

COLD, *effects of* Different animals will endure different degrees of cold without injury. Some perish suddenly upon the approach of intense cold, such as insects of almost all kinds: others are only thrown into a state of lethargic insensibility, from which they revive again upon the return of warm weather; such are the hybernating animals, as land-tortoises, dor-mice, &c. Man is capable of bearing very wonderful degrees of heat and cold: from 212° of Fahrenheit's thermometer and even upwards, though this is the heat of boiling water, to 30° or 40° or even more below 0 or zero. The cold at Quebec has sunk as low as—42°, and at Tornao M. MAUPERTIUS experienced a cold at—51° below the zero, and this is said to be nothing compared with what it has been known in some parts of Siberia; in which cases respiration is accompanied with prodigious pain, and seems to fill the lungs as with boiling liquid, while from the increased elasticity of the air, the surrounding rocks and trees often split with reports like cannon.

In the northern climates of Sweden and Russia, where long sunny days succeed the melting of copious snows, the gardeners are obliged to shelter their wall-trees from the meridian sun, in the vernal months; an useful precaution, which preserves them from the violent effects of cold in the succeeding night; and, by preventing them from flowering too early, avoids the danger of the vernal frosts. In a similar manner, the destruction of the more succulent parts of vegetables, such as their early shoots, especially when exposed to frosty nights, can only be counteracted by covering them from the descending dews, or rime, by the coping stones of a wall, or mats of straw.

Having given a short account of the sensible effect of a cold temperature, on animal and vegetable life, we shall conclude with a few remarks connected with the *natural history* of this elementary power. The properties of *cold*, which is only a less degree of heat, seem to be directly opposite to those of *heat:* the latter increases the bulk of all bodies; the former contracts them; and, while fire tends to dissipate their substance, cold condenses them, and strengthens their mutual cohesion. Fluids sensibly contract in a cold temperature, till the moment they begin to freeze, when they immediately dilate, and occupy more space than they possessed while in a state of fluidity, owing to their chrystallising. Hence, liquor frozen to ice in a close cask, is often known to burst the vessel; when ice is broke on a pond, it swims upon the surface; a certain proof of its being lighter, or of a larger bulk, than an equal quantity of water.

COLEOPTERA: the first order of insects in LINNÆUS's zoological system, which includes all those whose wings are guarded by a pair of strong, horny exterior cases or coverings under which the wings are folded up when at rest. In common language these insects are called beetles This order contains an immense number of insects.

COLIC, a disease attended with wandering pain in the bowels, and rumbling noise; both abating on the expulsion of wind: there is a slight degree of thirst; the pulse is scarcely affected, and the pain is not increased by pressure, as is the case in inflammations.

This complaint may arise from a great variety of causes; the principal of which are, 1 Flatulency; 2. Tough, pituitous humours, clogging the intestines; 3. Worms; 4. Bile; 5. The Piles; 6 Hysterics; 7. Acrid food or drink; 8. The inhalation of vapours arising from the decomposition of lead; 9. Rheumatism; 10 The use of sour wines and cyder; 11. The gout; 12. A sudden cattarrh; 13. An acid generated in the first passages; 14. Obstructions in the intestinal canal; and, 15. Poisonous substances introduced into the stomach

We think it our duty to caution the reader against the use of heating, stimulating, or spirituous remedies, in every kind of colic, except that arising *solely* from flatulency, without any other predisposing cause: as, however, no ordinary observer will be able to ascertain whether the expulsion of wind, which generally accompanies this complaint, be its generating cause, or only a concomitant symptom, we seriously recommend, in such a state of uncertainty, to abstain from all violent remedies; to apply no other but emollient clyster and fomentations; and to drink large portions of lilac-flower or chamomile tea, or take any other diluent beverage, till the spasms be relieved, and the nature of the disease more clearly understood. These remedies are not fraught with danger; and if properly persisted in, have frequently been attended with the most desirable effects

In common cases of colic, relief is soon obtained by opening the bowels, either by Glauber's salts, by magnesia and rhubarb, by castor-oil, or by purging clysters; and by afterwards giving laudanum in small doses every half hour. But in some violent cases, a most obstinate costiveness prevails, attended by alarming vomiting. In this case the clysters must be repeated every half hour, *some blood* taken away, and *cold water dashed on the feet* After the bowels have been well opened, opium in small doses may be given. In some instances the *warm bath* has produced immediate relief. Many persons are subject to frequent returns of this painful disease, which, very probably, proceeds from gall-stones.

Horses are frequently affected by *colics*, in consequence of violent exercise, or of the animal being permitted to eat too much green herbage, or of bad hay, new oats, or Indian corn blades. The symptoms, according to Ryding, are great restlessness, frequent attempts to lie down; the hind extremities are drawn under the body; and the horse rolls frequently. Two or three quarts of blood must be taken away, and the operation may be repeated, if required; but above all clysters ought to be injected, composed of the following ingredients: water, half a gallon; Glauber's salt, ½ lb; oil of any kind, one pint; molasses, one pint; *mix*. This quantity must be injected by a large pewter syringe, every half hour, until the bowels are well opened. If the pain be not removed, a pint of sweet-oil or castor oil, may be poured down the throat, in order to open the whole intestinal canal; after which, clysters of linseed decoction, with the addition of a table-spoonful of laudanum, may be injected every hour until ease be procured. A table-spoonful of laudanum may also be poured down the throat, and the horse kept warm.

COLLEGE, an assemblage or society of persons. In a more limited sense, a college is a public place, where the several parts of learning are taught, and where the students reside, under a regular discipline. An assemblage of several of these colleges is called a *university*. The establishment of colleges or universities forms a remarkable period in literary history. The schools in cathedrals and monasteries confined themselves chiefly to the teaching of grammar. There were only one or two masters employed in that charge; but in colleges, professors are appointed to teach all the branches of science. The first obscure mention of academical degrees in the university of Paris, from which the other universities of Europe have borrowed most of their customs and institutions, occurs, A. D 1215.

COLLIMATION, line of, in a telescope, is that which passes through the tube, and cuts both the focus of the eye-glass, and the centre of the object-glass

COLLISION, in mechanics, is the meeting or mutual striking of two or more bodies, one of which, at least, is in motion See PERCUSSION.

COLONY, a company of people transplanted into a remote province in order to cultivate it. There are three kinds of colonies, 1. Those serving to ease a country, where the people are become too numerous. 2. Those established by conquerors in the midst of vanquished nations to keep them in awe and obedience. 3 Colonies of Commerce, in which trade is the sole object of their establishment.

COLOPHONY, *black*, is pitch: *white*, is rosin.

COLOQUINTIDA See CUCUMBER.

COLOUR, in physics, is stated to be "a property inherent in light, by which, according to the various sizes of its parts, or from some other cause, it excites different vibrations on the optic nerve, which, propagated to the sensorium, affect the mind with different sensations" Every ray of light is supposed, by Sir I. NEWTON, to be divided into seven colours, viz *Red, orange, yellow, green, blue, indigo, violet* Others contend that there are but three primary colours, viz. the *red*, the *green*, and the *violet* See OPTICS

The explanation of colour, by the ancient philosophers, was vague and unsatisfactory, till Sir ISAAC NEWTON, in 1666, discovered that the coloured image of the sun, formed by a glass prism, was not of a circular, but of an oblong form, contrary to the supposed laws of refraction. Hence he conjectured, that light is not *homogeneal*, or a simple body, but that it consists of rays, some of which are much more refrangible than others. This theory was very generally received, and subsequently improved upon by Dr. HOOKE, as well as by other native and foreign philosophers; and, though the doctrine of colours is far from being determined with sufficient precision, yet we are warranted to admit the truth of the following propositions:

1. All the colours in nature proceed from the rays of light.

2. There are seven primary colours; namely, red, orange, yellow, green, blue, purple, and violet or indigo.

3. Every ray of light may be separated into the seven primary colours

4. The rays of light in passing through the same medium, have different degrees of refrangibility.

5 The variation in the colours of light arises from its different refrangibility: that which is the least refrangible producing red; and that which is the most refrangible, violet.

6 By compounding any two of the primary colours, as red and yellow, or yellow and blue, the intermediate colour, as orange or green, may be produced.

7 The colours of bodies arise from their dispositions to reflect one sort of rays, and to absorb the other.

8. Such bodies as reflect two or more sorts of rays, appear of various colours.

9 The whiteness of bodies arises from their disposition to reflect all the rays of light promiscuously.

10 The blackness of bodies proceeds from their incapacity to reflect any of the rays of light. Hence it is, that a black body, when exposed to the sun, becomes heated much sooner than any other.

Although, of all sensible qualities, colour is the least useful in ascertaining the virtues and powers of vegetables; yet, as the following general positions have been laid down on this subject, by LINNÆUS, and as they appear to be sufficiently attested by experience, we shall conclude this article with specifying them.—A *yellow* colour generally indicates a bitter taste, as in gentian, aloe, celandine, turmeric, and other yellow flowers *Red* denotes an acid or sour taste; as in cranberries, barberries, currants, raspberries, mulberries, cherries, the fruit of the rose, sea-buckthorn, and service-tree. Herbs that turn red towards autumn, have also an acid taste; as sorrel, wood-sorrel and bloody dock. *Green* indicates a crude, alkaline taste, as in leaves and unripe fruits. A *pale* colour denotes an insipid flavour, as in endive, asparagus, and lettuce. *White* promises to be sweet and luscious to the palate; as in white currants, and plums, sweet-apples, &c. Lastly, *black* indicates a harsh, nauseous, and disagreeable taste, as in the berries of deadly night-shade, myrtle-leaved sumach, herb-christopher and others; many of which are not only unpleasant to the taste, but pernicious and fatal in their effects.

COLOUR, scale of. It is found that if the spectrum of the sun's image formed by refracted light, let into a darkened room, be longitudinally divided by the points separating the different colours, into 360 parts, the

Red will occupy	45
Orange	27
Yellow	48
Green	60
Blue	60
Indigo	40
Violet	80.

[And if a wheel, made of pasteboard divided into 360 parts, and coloured in the proportions above mentioned, be turned round swiftly, none of the colours will appear separately, but a white will be produced.—T. C.]

COLOUR, in painting, is a word used both for the drugs or pigments, and for the tints they produce.

COLOURS, *oil*, those pigments that may be used in painting in oil. I. The principal *colours* used in painting flesh, and from which all the tints are made, are these: 1 Flake-white, or fine white, which should be ground with the finest poppy oil. White is a friendly-working colour, and comes forward with yellows and reds, but retires with blues and greens As it is the nature of all whites to sink into whatever ground they cover, they should always be laid on white 2. Ivory-black, the best black, and a colour that sympathises and mixes kindly with every other. It is a true shade for blue; and, with a little Indian red, makes the best general shadow-colour. It is ground with linseed-oil, and used with drying oil. Black is a cold, retiring colour. 3. Ultramarine, the finest blue in the world, but costly, and seldom used. It is a tender retiring colour, never glaring, beautiful for glazing, and used with poppy-oil. 4 Prussian, a very fine blue, and a good working-colour. It is ground with linseed oil, though nut-oil is more proper. It should never be used in the flesh; but always in the green-tint, and the eyes. 5. Light-ochre, a friendly mixing colour, and of great use in the flesh; it is usually ground with linseed-oil, but nut-oil is better All yellows are strengthened with reds, and weakened with blues and greens. 6. Light-red or light burnt-ochre: this, with white, produces the most perfect flesh-colour that can be made. It is a beautiful, clean, kind-working colour; but too strong for the white, and therefore will

grow darker. It should be ground and used with nut-oil. 7 No vermilion, but what is made of the true native cinnabar, should ever be used. It will not glaze; but is a fine colour when glazed itself It is ground with linseed-oil, and should be used with drying-oil. 8. Carmine, the most beautiful crimson, a middle colour between lake and vermilion, is a fine working colour, glazing delightfully. It should be ground with nut-oil, and used with drying-oil. 9. Lake, a tender, sympathising, deep red; but of no strong body, and therefore to be strengthened with Indian red. It is the best glazing-colour that can be used It is ground with linseed-oil, and used with drying-oil. 10 Indian-red, a strong, pleasant working-colour: but it will not glaze well; and, when mixed with white it falls a little into the lead. It is ground and used as lake. 11. Brown-pink, a fine glazing colour; but of no strong body: in the flesh it should never join, or mix with the lights; because this colour and white antipathise, and mix of a warm dirty hue for which reason, also, their joinings should be blended with a cold middle tint. In glazing of shadows, it should be laid before the colours that are to enrich it: it is one of the finishing colours, and therefore should never be used alone in the first painting. It is strengthened with burnt umber, and weakened with terra-vert: ground with linseed-oil, and used with drying-oil. 12 Burnt umber is a fine, warm brown, and an easy working, strong colour, it is of great use in the hair, and mixes charmingly with the warm shade

II. The principal tints that are absolutely necessary for painting flesh, all of which are made from the principal colours, are these 1. Light-red tint, is made of light red and white: it is the most kind and best-conditioned of all colours for the general ground of the flesh. With this, and the shade-tint, all the flesh should be made out, like claro obscuro, or mezzotinto It should also be remembered, that this colour will grow darker, because it is in its nature too strong for the white: wherefore it should be improved; that is, some vermilion and white mixed with it, in proportion to the fairness of the complexion. 2 Vermilion-tint is vermilion and white, mixed to the middle tint: it is the most brilliant pale-red, and agrees particularly well with the white, light, and yellow tints 3. Carmine-tint is carmine and white, mixed to a middle-tint, and the most beautiful red that can be used for the cheeks and lips: it is one of the finishing colours, and should never be used in the first painting, but laid upon the finishing colours, without mixing. 4. Rose-tint is made of the red-shade, and white, mixed to a middle degree or lighter It is one of the cleanest and most delicate tints that can be used in the flesh, for clearing up the heavy, dirty colours; and, in changing, it sympathises and mixes kindly. 5. Yellow-tint is often made of Naples-yellow and white: but others use light ochre, which is a good working colour. It is to be remembered, that ochre is too strong for the white, and, therefore, a little allowance should be made in using it. It follows the light-red tints, and should always be laid before the blues. If too much of it is laid, the ground it has been laid on may be recovered with the light red tints. 6 Blue tint is made of ultramarine, or prussian, and white, mixed to a lightish azure: it is a pleasant working colour; and with it should be blended the gradations It follows the yellows, and with them makes the greens; and with red produces the purples No colour is so proper for blending down, or softening the lights into keeping. 7 Lead tint is made of ivory black and fine white, mixed middle degree: it is a fine retiring colour, and therefore is of great use in the gradations, and in the eyes 8 Green-tint is made of prussian, light ochre and white. This colour will dirt the lights, and should be laid sparingly in the middle tints: it is most used in the red shadows, where they are too strong. It is of a dirty, antipathising nature 9. Shade-tint is made of lake, indian-red, black, and white, mixed to a beautiful murrey colour, of a middle tint. This is the best colour for the general ground of shadows; for which reason it called the shade-tint: it mixes with the lights delightfully, and produces a pleasant, clean colour, a little inclined to the reddish pearl. As all the four colours of its composition are of a friendly, sympathising nature, so consequently, this will be the same; and may, therefore, be easily changed, by the addition of any other colours 10. Red-shade, is composed of lake and a very little indian-red It is a charming working-colour and a good glazer; it strengthens the shadows of the shade-tint, receives, when it is wet, the green and blue tints agreeably, and is a good ground for all dark shadows. 11 Warm-shade is made of lake and brown-pink,

mixed to a middle degree. It is a fine colour for strengthening the shadows on the shade-tint, whether they are wet or dry. Care must be taken that it does not touch the lights, because they will mix of a dirty snuff-colour; and it should therefore be softened with a tender, cold tint. 12 Dark-shade, is made of ivory black, and a little Indian-red only. This colour mixes very kindly with the red-shade, and sympathises agreeably with the middle tints in the dead colouring. It is a charming glazing colour for the eyebrows and darkest shadows; of all others, the most excellent shadow colour; and one of the finest working colours we possess.

III The colours and tints that are necessary for the *first painting* of the flesh, are these:—1 Fine white; 2. light ochre, and its two tints; 3. light red, and its two tints; 4 vermilion, and its tint; 5. a tint made of lake, vermilion and white; 6 rose-tint; 7. blue tint; 8 lead-tint; 9 green-tint; 10. half-shade tint, made of Indian-red and white; 11 shade-tint; 12. red-shade; 13 warm-shade. The finishing pallet for a fine complexion requires six more, viz carmine and its tint, lake, brown pink, ivory-black, and prussian-blue

IV. The principal colours used in *landscapes*, are, 1 Fine white; 2 common-white; 3. fine light-ochre; 4 brown oker, 5. brown-pink; 6 burnt umber; 7. ivory-black; 8 prussian-blue; 9 ultramarine; 10 terra-vert; 11. lake; 12. Indian-red; 13. vermilion; 14. king's-yellow.

V The principal *tints* used in landscapes, are, 1. light-ochre and white; 2. light ochre, prussian, and white; 3. light-ochre, and prussian; 4. the same, darker; 5 terra-vert and prussian; 6. brown-pink and prussian; 7. brown-pink and brown ochre; 8 brown-ochre and prussian; 9. indian red and white; 10. ivory black, indian-red and lake. The *colours* necessary for *dead-colouring*, are, common-white, light-ochre, brown-ochre, burnt umber, indian-red, ivory black and prussian The principal *colours* for painting the sky, are fine white, ultramarine, prussian, light-ochre, vermilion, lake, and indian red. The *tints* are a fine azure, light ochre, and white, vermilion and white; and a tint, made of white, a little vermilion, and some of the light azure.

VI. The principal *colours* that are necessary for painting *back grounds in portraiture*, as walls, or buildings, are white, black, indian-red, light and brown-ochre, prussian, and burnt umber, from which the eight principal tints are made, as follows: 1. pearl, of black, white, and a little indian red; 2 lead, of black and white, mixed to a dark lead colour; 3. yellow, of brown-ochre and white; 4 olive, of light-ochre, prussian and white; 5. flesh, of indian-red and white, mixed to a middle tint; 6. murrey, of indian-red, white, and a little black, mixed to a kind of purple, of a middle tint; 7 stone, of white, umber, black and indian-red; 8. dark-shade, of black and indian-red, only. Here, the lead-tint serves for the blues; the flesh tint mixes agreeably with the lead; and the murrey is a very good-blending colour, and of great use where the olive is too strong. The umber, white, and dark-shade, will produce a fine variety of stone colours: the dark-shade and umber, used plentifully with drying oil, make a charming warm shadow-colour. All the colours should be laid with drying oil only, because they mix and set the better with the softener.

Colours, *Water*, those that are used in painting with gum water, or size, of which such as are resinous, or gummy, are not miscible with oil.

The most convenient colours to use, are those ready prepared in cakes; for, with a little water, they will instantly rub up on a Dutch tile. In case these colours are used, you will only want a few Dutch tiles, camel-hair pencils, and some water.

The following are the colours in general use.

For Flower Painting Gamboge, Indian yellow, carmine, vermilion, lake, Prussian blue, ultramarine, Antwerp blue, raw sienna, burnt ditto, burnt umber, sap green.

For Landscape Painting. Gamboge, raw sienna, burnt ditto, ditto, Indian red, indigo, sap green, light red, lake; vandyke brown, sepia, yellow ochre.

By means of these colours, most others are made; the tints of which vary continually. A little practice, however, will soon enable the learner's judgment to make up any colour he may be in want of.

Colours arising from Mixture.—

Ash colour. White and black, or indigo and black

Bay Vermilion, with a little Spanish brown and black.

Bright red. Indian lake and native cinnabar

Buff Yellow ochre and white

Chesnut. Umber, lake, and white

Carnation. Lake and white, shaded with lake.

Changeable silk Red and water of masticot, shaded with sap green.

Cloud. White, light masticot or lake, and white shaded with blue verditer, or blue verditer alone.

Crimson cinnabar. Lake and white, shaded with lake.

Dove, or for the Wings of an Eagle. Take white, a little lake, and a little

Flame. Vermilion and orpiment, or red and masticot, heightened in with white.

Flesh. White, with a little carmine and red, and yellow ochre for a swarthy complexion.

Grass green. Verdigris and pink.

Lead. Indigo and white.

Lion tawney. Red and masticot, shaded with umber.

Cinnabar. Lake and white.

Orange Red, and a little fine masticot, shaded with gall-stone and lake.

Orange tawney. Cinnabar, light pink, and a little masticot, shaded with gall-stone and lake.

Pearl. Carmine with a little white, shaded with lake.

Purple. Indigo, Spanish brown, and white; or blue bice, with red and white; or blue bice and lake.

Scarlet. Red and lake, with or without vermilion; or carmine and Indian lake; or native cinnabar and red, shaded with Indian lake.

Sea green. Bice, pink and white, shaded with green pink

Straw. Yellow masticot, and a very little cinnabar, shaded with dark pink.

Violet. Indigo, white, cinnabar, and lake; or fine Dutch bice and lake, shaded with indigo, or smalt blue bice. The latter must predominate.

NEUTRAL TINTS.—The neutral tints are now in general use among all the professors of the art of painting; and when judiciously managed produce a most beautiful and striking effect The most common mixture for these tints are as follow:

1. Prussian blue, Indian ink, and lake.

2. Indigo, Indian red, and a little Indian ink.

3. Indigo, light red, and Roman ochre

4. Madder lake, indigo, and burnt Sienna.

Shadowing with any of these neutral tints, is superior to Indian ink, by producing a much softer and warmer effect, and, when properly incorporated, look very beautiful.

SEPIA.—The colour called Sepia is a beautiful warm colour, it is now in general use amongst all the artists of celebrity. When managed properly, produces a most beautiful and striking effect, and is much superior in every respect to Indian ink, being so much softer and is readily divided into a variety of tints.

COLOURS *of Plants.*—The primitive colours, and their intermediate shades and gradations, are enumerated by botanists, as follows:

English.	Latin.
Water colour.	*Hyalinus.*
WHITE.	
Lead-colour.	*Cinereus.*
BLACK.	NIGER.
Brown.	*Fuscus.*
Pitch-black.	*Ater.*
YELLOW.	LUTEUS.
Straw-colour.	*Flavus.*
ame colour.	*Fulvus.*
ron, or rust-colour.	*Gilvus.*
RED.	
Flesh-colour.	*Incarnatus.*
Scarlet.	*Coccineus.*
PURPLE.	
Violet-colour.	*Cæruleo-purpureus*
BLUE.	CŒRULEUS.
GREEN	

Under this head, although at the expense of a little repetition, we shall enumerate the general positio , on the indications of colour with re pect to the virtues of vegetables, as laid down by LINNÆUS. A yellow colour commonly indicates a bitter taste; as in gentian, aloe, celandine, and turmeric. Red, an acid or sour taste; as in cranberries, barberries, currants, raspberries, mulberries, cherries, the fruit of the rose, sea-buckthorn, and service-tree. Herbs that turn red toward autumn, have likewise a sour taste; as sorrel, wood-sorrel, and bloody dock. Green indicates a crude alkaline taste, as in leaves and unripe fruits A pale colour denotes an insipid taste, as in endive, asparagus, and lettuce White promises a sweet and luscious taste; as in white currants and plums, sweet apples, &c. Lastly, black indicates a harsh, nauseous, disagreeable taste; as in the berries of deadly-night-shade, myrtle-leaved sumach, herb-christopher, and others; many of which are not only unpleasant to the taste, but pernicious and deadly in their effects.

COLOURS, in heraldry, are red, blue, black, green, and purple; which the heralds call GULES, AZURE, SABLE, VERT,

and PURPURE. Tenne or tawny, and sanguine, are not so common. The yellow and white, called *or* and *argent*, are metals, not colours. The metals and colours are sometimes expressed in blazon by the names of precious stones, and sometimes by those of planets or stars.

COLOURS, in military affairs, include the banners, flags, ensigns, &c. of all kinds, borne in the army or fleet.

COLOURS in the Latin and Greek churches. There are five admitted into the Latin church, viz the *white* for the mysteries of Christ, the feasts of the virgin, angels, saints, and confessors, the *red* for the solemnity of the holy sacraments, the feasts of the apostles, &c,; the *green* for the time between Pentecost and Advent; the *violet* in Advent and Christmas, and in votive masses in time of war, and the *black* for the dead and the ceremonies belonging thereto. In the Greek church, the use of colours is nearly abolished the red was the colour for Christmas and the dead, as black is among us.

COLOUR-MAKING, is the art of preparing various colours employed in painting This art, though one of the most curious branches of chemistry, is the least understood. The principles that govern it, differ totally from those, on which the theory of other parts of chemistry is founded; and as the practical part is in the hands of persons who sedulously conceal their methods of preparing colours, we have only a superficial theory, and are but imperfectly acquainted with the practice.

Colours are divided into various classes, such as opaque and transparent; oil and water-colours; simple and compound; true and false.

I. *Opaque colours* are those which, when laid on any substance, efface every other painting or stain; such as white and red-lead, vermilion, &c. *Transparent* colours possess the peculiar property of leaving the ground, on which they are laid, visible through them These are employed for illuminating maps, charts, &c.

II. *Oil* and *water-colours* are thus denominated, from their being appropriated to painting in oil and in water.

In preparing oil-colours, care must be taken to grind them extremely fine; and, when they are put on the pallet, to mix those which will not dry of themselves, with drying oils; and also to mix the tinged colours in as small quantities as possible. With respect to the application of them, if employed for large pieces, they should be laid on full, in order that they may incorporate, and more firmly adhere. If they are intended to be *glazed*, particular care must be taken to paint the under-colour strong and smooth; after which the others may be gradually added, till the whole is properly filled up. Oil colours are, however, sometimes worked dry, where only one is used, as in *cameos*, in which the gradations of colours of distant objects are usually managed by lights, as with crayons; and in *basso relievos*, which are imitations of sculpture, of every kind and colour.

Water-colours are wrought in various modes; namely, in *distemper*, (as the artists express it,) where the colours are prepared in size; in *fresco*, or painting on fresh mortar, in which case it is requisite that the colouring be quick, lest the stucco or mortar dry, before it can be laid on; and that it be neatly and carefully executed; each colour being properly placed, and occasionally intermingled by parcels; in *agouache*, where the colours are mixed with gum, and the pencil drawn along, as in paint and washings; and lastly in *miniature*, for small and delicate works, in which the colours are required to be very fine and clean, to be mixed with gum, and worked in dots or points.

III *Simple and compound colours*. The former are perfect in themselves, such as red and white lead, vermilion, the calces of iron, &c; the latter are formed by the union of two or more colouring substances; for instance, blue and yellow, when blended together, make a green; red and yellow, an orange; and white earth and cochineal, a lake, &c.

IV. The last and most important division of colours, is into *true* and *false*: the former retain their pristine tinge, without fading, under every possible variety of circumstances; the latter either lose their colour entirely, or change into some other shade.

Colours are chiefly affected by being exposed to the sun during the summer, and to the cold air in winter. White lead, however, forms an exception; as, when ground with oil, it retains its whiteness, if it be exposed to the weather, but degenerates into a brownish or yellowish cast, in a confined situation. Nevertheless, when it is immersed in water, it is totally divested of its colour, whether it be exposed to the effects of the air or not. In the

making of colours, the chief object is, that they may not fade, from the influence of the weather; though it must be regretted that the most beautiful are, in general, the least permanent. It may, however, for the most part be assumed, that the more simple any colour is, the less liable it will be to change by exposure to the air.

Having thus briefly stated the general theory of colours, we shall also give some account of the different pigments which are most commonly employed by colour-makers.

1. Black, consists of several sorts, such as lamp-black, ivory-black, blue-black, and Indian ink. The first of these is the finest of what are called soot-blacks, and is more used than any other. Its preparation depends on the manufacture of common resin. The impure juice collected from incisions made in pine, and fir-trees, is boiled down with a small quantity of water, and strained, while hot, through a bag; the dregs and pieces of bark remaining in the strainer, are burnt in a low oven, whence the smoke is conveyed through a long passage into a square chamber, at the top of which is an opening, with a large sack affixed, made of thin woollen stuff: the soot, or lamp-black, concretes partly in the chamber, whence it is swept out once in two or three days, and partly in the sack, which is occasionally agitated, in order to take down the soot, and to clear the interstices between the threads, so as to admit a free current of air. This method of preparing lamp black, was originally invented in Sweden, but has also been introduced into this country; and is now carried on to a considerable extent in the turpentine-houses, from the refuse of resinous matters.

Ivory-black is prepared from ivory, or bones, burnt in a close vessel; and, when finely ground, affords a deeper and more beautiful colour than lamp-black; but it is, in general, so much adulterated with charcoal, and so grossly levigated, as to be unfit for use. An opaque deep black, for water-colours, may be prepared, by grinding ivory-black with gum water; or with the aqueous liquid that settles from the whites of eggs, which have stood some time to subside.

German Black. See *Frankfort Blacking*.

Blue-black is said to be prepared from the burnt stalks and tendrils of vines. This is, however, seldom done by colour-makers, who generally substitute a mixture of ivory black, and the common blue used for dyeing cloths.

Indian-ink is an excellent black for water-colours, and may be thus imitated. Boil an ounce of fine lamp-black in a little water, in an earthen vessel, taking care to skim it. Add a drachm (60 grs.) of gum Arabic (or cherry-tree gum,) and evaporate till the mass has acquired consistence enough to be made into tablets.

2. White, of which there are several kinds; as flake-white, white-lead, calcined hartshorn, pearl-white, Spanish-white, egg-shell-white, and magistery of bismuth.

Flake white and *white-lead*, are the produce of the same metal.

Flake-white is a purer kind of white-lead, washed and ground over again. White lead is thus made: Rolled or milled lead is twisted up in a spiral form, and placed on end, on wooden crosses in earthen vessels. Vinegar is put in the vessels up to the cross. The vessels are then put into a bed of horse-dung, the tops being closely covered with a flat plate of lead. The heat of the dung raises the vinegar in steam, and corrodes the plates. The white-lead is scraped off, and ground in a mill, and well washed. In lieu of horse-dung, larger vessels may be used, and a gentle fire. The vinegar may be evaporated after some time for sugar of lead. White lead is adulterated with whiting or tobacco-pipe clay. Spirit of salt will dissolve the whiting: or take an oz of pure white-lead, and flux it with charcoal, and an oz of suspected white-lead, and do the same; the different quantities of metal obtained will shew the amount of the adulterations. For substitutes for white paint see article Painting.

(See White Lead.) These two are the only whites that can be used in oil; all the rest being transparent, unless laid on with water.

Calcined hartshorn is the most useful of the earthy whites, as it contains the least proportion of alkali.

Spanish-white is only chalk, very finely prepared.

Pearl-white is made from oyster-shells, as *egg-shell white* also is from those of eggs. All these, from their attraction for acids, necessarily destroy those colours which are compounded with any acid or metallic salt.

The *magistery of bismuth* is apt to turn black, as well as flake-white, and

white-lead, when employed for a water-colour

3 Red. The principal red colours used in painting, are carmine, rose-pink, vermilion, and red-lead.

Carmine is the brightest and most beautiful red colour known at present.

This is said to be prepared from cochineal. Into a very clean tin pot with a cover, pour 10 or 12 quarts of pure water; let it simmer but not boil: put in an ounce of finely powdered and sifted cochineal, and let all boil gently for ten minutes; then add 30 grs. of finely powdered Roman alum, and boil again twenty minutes, remove the pot from the fire, and stand covered till it cools. Drain off the water when cool, gently, and the sediment that falls from it, will be the finest carmine. This will happen in 48 hours. Pour off the water, and if coloured, let it settle again in another dish. The grosser sediment is *red lake*. The finer sediment is carmine when collected and dried. The sediment may be again boiled and left to settle.

[The colour is improved by pouring on the sediment a weak solution of tin in the nitro-muriatic acid.—T. C.] In the same way may be made lakes from Brazil wood, and madder, and kermes berries. For another recipe, see article Carmine.

Rose-pink is a very delicate colour, inclining more to purple than scarlet. It is prepared from chalk, coloured with a decoction of Brazil wood, heightened by an alkaline salt, which renders it very liable to fade, and of little value. This colour might be made more durable, by employing for its basis the white precipitate of lead; and by brightening it with a solution of tin.

Vermilion consists of sulphur and quicksilver, the former of which is melted, when the quicksilver is stirred in, and the whole is converted into a black mass. See Cinnabar.

If vermilion be adulterated with red-lead, it may be discovered by fluxing it with charcoal in a crucible; the vermilion will evaporate, and the lead be reduced.

Red-lead is a calx, of a lively yellowish colour, which it acquires by slow calcination. Both these colours are very durable; the former, however, is the best red for oil painting, but does not answer with water; the latter inclines to an orange; and, like other preparations of lead, frequently turns black.

Venetian-red is a native red *ochre*, but imitated by colcothar, or the residuum of green vitriol after the old method of procuring oil of vitriol by distilling nitre with green vitriol.

4. Orange. The genuine orange-coloured paints are, *red orpiment*, and *orange-lake*: the first of these is a sublimate formed of arsenic and sulphur; the other may be prepared from turmeric, infused in spirit of wine, having its colour struck upon calx of tin, and brightened by a solution of that metal. The different shades of orange may, however, be prepared by mixing red and yellow colours together in due proportions.

5. Yellow. The chief colours of this kind are, Kings and Naples yellow, Dutch-pink, and Turbith-mineral.

King's-yellow is prepared from arsenic. Its colour is very beautiful, but apt to fade, on which account, as well as from its great price, it is but seldom employed.

Naples-Yellow. This is a natural production found near Naples, consisting of a kind of lava, unchangeable by fire and by acids. The artificial kind is thus made. Mix 12 ounces of white lead, 2 ounces of diaphoretic antimony (the washed calx of antimony), ½ an oz. of calcined alum, and 1 oz. of pure sal ammoniac, pound them well together, put them in an earthen crucible, with a cover, calcine them in a slow fire, so that the crucible shall not be hotter than a dark red heat, continue this for three hours. If a bright golden colour be wanted, add ½ oz. more of antimony, and ¼ oz. of sal ammoniac. Do not let iron touch this colour.

Those who may wish to inform themselves more particularly concerning Naples-yellow, and the different methods of preparing it, are referred to the translation of a paper by Professor Beckman, inserted in *Tilloch's Phil. Mag.* vol 3.

Turner's Patent mineral yellow. [Is made by grinding 4 parts of litharge with one part by weight of common salt on a platform with a vertical wheel for 12 hours. The salt is decomposed, pure soda is produced, and muriate of lead: the soda is chrystallised in a [illegible] where charcoal is burnt, and the muriate of lead fused in crucibles into patent yellow.—T. C.]

Turbith-mineral is, at present, but little used in painting, though it appears to be very durable, and is therefore preferable both to King's and Naples yellow.

Dutch-pink. Boil ½ lb. of turmeric

berries in one gallon of water, and add whiting to the clear liquor: the colour will unite to the whiting which should be collected and dried.

6 Green. The only simple green of a tolerable degree of brightness, is *verdigris*, or its different preparations: though far from being durable, it may be rendered more so, as a water colour, by dissolving it in the pure tartarous acid. A green colour may be made by compounding Prussian or other blue, with yellow; but it is by no means fixed, and much inferior to common verdigris.

Brunswick-green. This is a German colour, not used in England. It is said to be a *tartarised copper*, made thus: Dissolve one part by weight of sal ammoniac in water: lay in it three parts by weight of copper plates; when a green rust forms, wash it off, and repeat this till the copper is entirely corroded. 12 parts of copper give 17 parts of common Brunswick green, which is precipitated by boiling it with tartar.

Scheele's-green. This excellent colour was discovered by the Swedish chemist Scheele, and is made thus. Dissolve 2 lbs. blue vitriol in about three gallons of boiling water in a vessel capable of holding at least four gallons more. In another vessel boil together 2 lbs. of pearl ash, and a pound and a half of *white arsenic*, in about 2½ gallons of water; boil it till the arsenic is dissolved, or nearly so; then pour this last hot solution into the first while hot, it will effervesce a good deal, and, therefore, the vessel should be large. The precipitate will be a finer powder, in proportion to the quantity of water used. Wash and dry it. The produce will be about ¼ of colour. *Common green colour* may be made by precipitating solutions of copper by whiting and potash.

Sap-green, is the inspissated juice of buckthorn berries obtained by expression.

To make a water colour from verdigris, pound four ounces of verdigris with 2 oz. of white tartar, and boil them in a half pint of water, taking care that none runs over: stir it often. Evaporate to a consistence, then pour it into a muscle shell to evaporate to dryness.

7 Blue. The principal blue colours are, Prussian and Dutch Blue, Verditer, Smalt, Bice, and Indigo.

Various processes have been adopted for the making of *Prussian-blue*, of which we shall select the shortest.

[In an iron pot calcine hoofs, parings of skins, blood, or any other refuse animal matter; to one part by weight of this material add half a part of potash, mix them and calcine them together in a red heat for an hour, in a covered iron pot; wash the substance remaining, which is prussiat of potash. To one part of green vitriol, (sulphate of iron) add ½ a part of alum, and add of the solution of prussiat of potash till no more precipitate falls: filter and collect this precipitate: digest it in dilute muriatic acid, till the fine blue colour is perfect.—T. C.]

Or, Take 3 lbs. of dried ox's blood, 4 lbs. 8 oz. of quick lime, 2 lbs of red tartar, and 1 lb 8 oz of salt-petre. Let them be calcined and lixiviated, when the ley should be poured into a solution of 4 lbs of alum, and 1 lb of green vitriol. This operation will produce the finest blue; but the quantity will exceed little more than 8 oz. and 4 drachms.

Prussian blue. The following process was recommended by Dr John Pennington. Mix six pounds of powdered black bones, with one pound of potash: press these ingredients closely into an iron pot, and cover it with an iron cover, well plastered with clay or earth. Expose the pot to a *bright red heat*, for three or four hours. When cool, take the ingredients out, dissolve the soluble parts in hot water, and strain through flannel. If the blue be wished of the very first quality, pour into the liquor, either *spirit of salt*, or oil of vitriol, until the boiling ceases on any fresh addition of the spirit. Pour the whole into a solution of half a pound of green vitriol in two gallons of water. If a lighter blue be wished, add a less quantity of the spirit of salt, or oil of vitriol, to the liquor from the bones, in which case add a quarter of a pound of alum to the solution of green vitriol: then mix a little of the two liquors in a phial, and if the colour be too light, add more of the spirit: mix the whole together as before. In the instant of mixing, the two liquors, which were before colourless and transparent, become of an opaque blue; in a few hours the blue fecula subsides, and leaves a transparent liquor on the top, which may be thrown away: the sediment must be stirred up with clean hot water, and suffered again to subside: this must be repeated seven or eight times, and then the fluid filtered through paper, and dried on a large cake of chalk.

Blue-verditer; add lime well burnt, fallen and sifted to a solution of blue vitriol. It is also made from the nitrated solution of copper left by refiners of silver after the operation of parting, or separating the silver by means of salt, from the nitrous solution. To this solution of copper, whiting or chalk is added.

Earths coloured blue by iron ore are often found native.

Dutch-blue. See BLUE.

[The preparation of *verditer* is, by precipitating the nitrate of copper, the refuse of the refiners, by means of lime, chalk, carbonate of potash, carbonate of soda, pure potash, and pure soda, each of which gives a different tint. Also by precipitating in the same manner a solution of blue vitriol.—T. C.]

Smalt is glass coloured with zaffre; a preparation from the calx of cobalt. It is, in general, so grossly pulverised as to be unfit for painting, and its texture is so hard, that it cannot easily be levigated. Its colour is exceedingly bright and durable; and, if finely pulverised, is little inferior to Prussian-blue.

Bice is prepared from the *Lapis Armenus*, a stone which was formerly brought from Armenia, but now from Germany. Bice bears the best body of all bright blues in common use, but it is the palest in colour. Being somewhat sandy, it is necessary to grind it very fine, and to wash it well, previously to its being used. It is as durable, and yields nearly as good a colour as Prussian-blue.

Indigo is but little employed in painting either in oil, or water, on account of the dulness of the colour. It requires no other preparation than that of being washed over before it is used. See INDIGO.

8. PURPLE. The only simple colour of this kind at present, is colcothar of vitriol, or *crocus martis*. A beautiful purple lake may be prepared from logwood, by means of a solution of tin. As this mode of preparing colours is but little known, we shall give a few hints respecting it, under the subjoined head of COLOURING MATTER.

9. BROWN. The chief brown colours are bistre and brown pink.

Bistre is prepared from the most glossy, and perfectly burnt soot, (chiefly of beech wood) pulverised, passed through a fine sieve: and boiled in water for half an hour in the proportion of 2 lbs. to a gallon of water. After settling, it is poured off, dried, and then baked in a little gum-water, and formed into cakes. This is a very useful colour in water, being exceedingly fine and durable, and not apt to spoil any other colours with which it is mixed. The *brown-pink* is said to consist of chalk tinged with the colouring matter of fustic, heightened by fixed alkaline salts. It is, consequently, very perishable, and seldom used.

COLOURING MATTER is contained in almost every flower and root of vegetables, and may be extracted by a very simple process. The Dutch prepare pigments of the most beautiful shades; for instance, a very fine azure blue, from the blossoms of the corn bluebottle, *Centaurea Cyanus*, L; a delicate red, from the fresh leaves of roses, especially the small French rose; an excellent violet from the flowers of that name, &c. in the following manner. Take the roots, leaves, or flowers of whatever quantity is desired, bruise them nearly to a pulp, put them into a glazed earthen vessel, pour a sufficient quantity of filtred water over them, and add a table spoonful of a strong solution of pure potash to every pint of the former. Boil the whole over a moderate fire, till the liquor is evidently saturated with the colour afforded by the vegetable; then decant the fluid part, either through blotting paper, or cloth, and gradually drop into it a solution of alum, when the colouring matter will subside at the bottom. This powder should again be washed in several fresh waters, till they pass away perfectly tasteless: at length, it must be once more filtred through paper, and the remaining substance perfectly dried. From this preparation are afterwards manufactured the finest pigments, or water-colours, of the shops, by triturating them on marble stones, with the addition of a little clarified gum-water, and then forming them into cones, cakes, &c.

COLUBER, the viper, in natural history. Of this genus, there are 175 species. The coluber *ferus* is found in most parts of Europe: it lives in woods and thickets, and, in breeding time, in the open fields: it is poisonous, but not deadly; it grows to a foot and an half long. The flesh was formerly used in medicine as a restorative. The poisonous matter discharged is a real gum, and perhaps the only gum actually produced and secreted by animals of any kind. Olive oil is the most successful application to the bite of a viper. Sucking the wound and throwing out

the saliva, is said to be a means of withdrawing part of the venom, and it is doubtful whether the poison be capable of producing any injury to the system when received into the mouth and stomach, unless the mouth, &c. be sore or ulcerated at the time. The viper is viviparous, that is, produces her young alive; and it is asserted, that the female in case of sudden surprise or danger, opens her mouth and admits her young down her throat, till the danger is passed by. The coluber *cerastes* is found in Arabia and Africa, and is probably the asp employed by Cleopatra. This animal springs suddenly to a considerable distance, and bites, without the least provocation, those who approach it. The inhabitants are said to have a preparation of herbs with which they arm themselves against the bite. The coluber *naja*, or hooded snake, is every where exhibited publicly as a show; it is taught to dance to the sound of musical instruments. The Indian jugglers, who thus exhibit the animal, first deprive it of its fangs, to secure themselves and the spectators from injury.

COLUMBO-ROOT, or COLOMBA-ROOT, an article lately introduced into medicine, chiefly by Dr PERCIVAL. The natural history of the tree, from which we obtain it, is but imperfectly known: it grows near the town of Columbo, in the island of Ceylon. The most active part of the root is its bark, which is imported in circular pieces, consisting of a cortical, woody, and medullary lamina, and having a rough surface. It has an aromatic odour, but a disagreeably bitter, and somewhat pungent taste. It is not possessed of any properties, superior to the common gentian.

COLUMN. See ARCHITECTURE.

COLURES, in astronomy, two great circles supposed to intersect each other at right angles in the poles of the world, and to pass through the solstitial and equinoxial points of the ecliptic. They are hence called the solstitial and equinoxial colures.

COMBINATION, in chemistry, denotes the intimate union of two or more bodies of different natures, from which a new compound results, differing in its nature from either of the constituents. Thus, an acid united with an alkali, gives a neutral salt, and furnishes a good instance of combination. Sulphur and lime may, by heat, be made to combine and form a sulphuret of lime, which compound is very different from its constituents.

COMBINATIONS, denotes the alternations or variations of any number of quantities, letters, &c. in all possible ways.

COMBUSTION, in chemistry, a term which denotes the decomposition of certain substances, accompanied by light and heat. It is an important effect of CALORIC (which see), but only particular bodies are subject to combustion. These are called combustible bodies. Combustible bodies, when inflamed, are sources of light and heat: thus sulphur, coal, &c are combustible bodies, and being raised to a certain degree of temperature, they give out light and heat. The capacity of producing light and heat gradually diminishes, and what remains after combustion appears to be a different substance, no longer combustible. All bodies that are not combustible are ready to receive caloric, and part with it again, giving out precisely the same quantity, neither more nor less A stone or brick is incombustible; it will receive heat, but, left to itself, it soon cools again, that is, it gives out the heat which it received, and which is not lost but imparted to surrounding bodies; thus the heat passing from it combines with the atmosphere Some chemists arrange all bodies under three classes, viz *combustibles. supporters*, and *incombustibles*. In this theory, the *light* is furnished by the *combustible*, and the *heat* by the *oxygen* of the *supporters*. Thus, in the combustion of sulphur, the sulphur affords the light, the oxygen of the air (the air being a supporter) gives out the heat, and the sulphuric acid which is the produce of the combustion, is incombustible. In the combustion of wood or coal, the wood and coal give the light, the oxygen of the air affords the heat, and the pure ashes, which are the result of combustion, are incombustible. These may still be heated to any temperature; but, like the brick or stone, just referred to, they undergo no more change.

COMET, an opaque, spherical and solid body, like a planet, which appears and disappears abruptly. Comets describe elongated circles, called ellipses, and are visible to us only when they reach those extremities of their orbits that are nearest to us and to the sun. When they pass through the long lines that run from one centre of their ellipsis to another, they appear to describe circles of prodigious magnitude; and very small ones when they arrive at that part of

their ellipsis of which the sun is the centre: hence the irregularity attributed to their course. When near the sun, they exhale a mass of vapours, called their *beard*, *tail*, or *hair*. These exhalations, which are not very dense, since the fixed stars may be seen through them, assume the different appearances that are distinguished as already related, according to the circumstances under which they are seen. Thus, when a comet is westward of the sun, and sets after it, it is said to be tailed, because the vapour seen is that which follows it; when the comet is eastward of the sun, and moves before it, it is said to be *bearded*, because the vapour is seen in its van, in the manner of a beard; and when the sun and the comet are exactly opposite each other, the earth between them, the vapour appears to surround it, in the form of a border of hair. From this last phenomenon the word *comet* is derived: *κομη*, *coma*, "hair." Comets, notwithstanding, have been seen without either tail, beard or coma, and whose discs were as clear, round, and well defined, as that of Jupiter. See SOLAR SYSTEM.

COMFREY, the common, or *Symphytum officiuale*, L. a native, perennial plant, which grows about two feet high, is found on the banks of rivers and wet ditches; and produces yellow-white flowers, in the months of May and June. It is eaten by sheep and cows, but horses, goats, and hogs refuse it. The leaves of this plant impart a grateful flavour to cakes and panada; the young stems, when boiled, are excellent and nutritious eating. A decoction of the stalks, with leaves and flowers, gives to wool prepared by a solution of bismuth, a fine and permanent brown colour.

But the most useful part of the comfrey, is its viscid and mucilaginous root. These roots are, at present, chiefly employed by colour-makers, who, by means of a decoction made of them, extract the beautiful crimson colour from *gum lac*. The natives of Angora, who possess the finest breed of goats in the world, prepare from the comfrey roots, a kind of glue, that enables them to spin the fleece into a very fine yarn, from which camblets and shawls are manufactured. The Germans have lately employed the same mucilage for correcting the brittleness of flax, and roughness of wool, in spinning: this preparation neither soils the fingers nor the yarn, and may be preserved in a fresh state for many days, in close wooden boxes.

COMMERCE, the exchange of commodities, or the buying, selling, or trafficking of merchandise, with a view to profit.

Commerce is at present divided into commerce by *land* and by *sea*; *inland* or *domestic*, and *foreign*; and by *wholesale* and *retail*.

COMMODORE, corrupted from the Spanish word *commendador*, a general officer in the marine, invested with the command of a detachment of ships of war, during the period of which he bears the rank of brigadier general in the army, and is distinguished from the other ships of his squadron by a broad pendant at his foretop. The name is also given to the oldest captain in a fleet of merchantmen, who leads the van in time of war, and carries a light in his top to keep the fleet together.

COMMON LAW, or the *unwritten law*, thus called, says M de Lolme, because not founded on any known act of the legislature. It receives its force from immemorial custom; and, for the most part, derives its origin from acts of parliament made in the times that immediately followed the conquest, particularly those anterior to the time of Richard the First, the originals of which are lost. The principal objects settled by the common-law, are the rules of descent, the different methods of acquiring property, and the various forms required for rendering contracts valid: in all which points it differs, more or less, from the civil-law. Thus, by the common law of England, lands descend to the eldest son, to the exclusion of all his brothers and sisters; whereas, by the civil law, they are equally divided between all the children: by the common-law, property is transferred by writing; but, by the civil law, *tradition*, or actual delivery, is moreover requisite, &c. The source from which the decisions of the common-law are drawn, is what is called *præteritorum memoria eventorum*, and is found in the collection of judgments that have been passed from time immemorial, and which, as well as the proceedings relative to them, are carefully preserved under the title of *records*. In order that the principles established by such a series of judgments may be known, extracts from them are, from time to time, published under the name of *reports*; and these reports reach, by a regular series, so far back as the

reign of Edward II. inclusively. Besides this collection, which is pretty voluminous, there are also some ancient authors of great authority among lawyers; such as Glanvil, who wrote under Henry II.—Bracton, who wrote under Henry III.—Fleta and Lyttleton. Among more modern authors, is Sir Edward Coke, lord chief justice of the king's bench, under James I. who has written four books of Institutes, and is at present the oracle of the common law. This law, moreover, comprehends some particular customs, which are fragments of the ancient Saxon laws, escaped from the disaster of the conquest; such as that called *gavel-kind*, in the county of Kent, by which lands are equally divided between the sons; and that called *borough-English*, by which in some particular districts, lands descend to the youngest son. Statute law began with magna charta.

COMMON MEASURE, is that which measures two or more things without a remainder. Thus of 8 and 12, a common measure is 2 and 4. The *greatest* common measure is the greatest number that can measure two other numbers; thus of 8 and twelve the greatest common measure is 4. To find the greatest common measure, "Divide the greater term by the less, then divide the divisor by the remainder if there be any, and so on continually till nothing remains, then is the last divisor the greatest measure sought."

COMMON-PLACE BOOK, a register of such thoughts and observations as occur to a person of reading or reflection. Mr Locke's celebrated method of arranging a common-place book is explained as follows:

The first page is to serve as a kind of index to the whole, containing references to every place or matter therein; and in the commodious contrivance of this index, so as that it may admit of a sufficient copiousness without any confusion, all the secret of the scheme consists. To this end, the first page, as already mentioned, or for more room, the number of pages necessary, are to be divided by parallel lines into 25 equal parts; whereof every fifth line is to be distinguished by its colour, or other circumstance. These lines are to be cut perpendicularly by others, drawn from top to bottom, and in the several spaces thereof the letters of the alphabet, capital and minuscle, duly written. The form of the lines and divisions, both horizontal and perpendicular, will be conceived from the following specimen, wherein what is to be done for every letter of the alphabet, is shewn in the two first: A, B.

A	*a*
	e
	i
	o
	u
B.	*a*
	e 1, 2.
	i
	o
	u

The index being thus formed, the book is ready for receiving insertions. In carrying them to the index, it is to be considered to what head the matter to be entered is most naturally referred, and under which it would most commonly be sought. In this head, or word, regard is to be had to the initial letter, and the first vowel, which are the characteristic letters upon which all the use of the index depends. "Suppose, for instance, I would enter down a passage that refers to the word *beauty*. *B*, I consider, is the initial letter, and *e* the first vowel: then looking upon the index for the partition *B*, and therein, for the line *e*, (which is the place for all words whose first letter is *b*, and first vowel *e*; as *beauty*, *beneficence*, *bread*, *breeding*, *blemishes*,) and, finding no numbers already down to direct me to any page of the book where words of this characteristic have been entered, I turn forward to the first blank page I find (which, in a fresh book, may be the second,) and here write what I have occasion for on the head of *beauty*; beginning the head in the margin, and indenting all the other subservient lines that the head may stand out and show itself: this done, I enter the page, where it is wrote, (viz 2) in the index, in the space *B-e*; from which time the class *B-e*, becomes wholly in possession of the 2d and 3d pages, which are consigned to words of this characteristic. Had I found any page or number already entered in the space *B-e*, I must have turned to the page, and wrote my matter in what room was left therein: so, if after en-

tering the passage on beauty, I should have occasion for *benevolence*, or the like, finding the number 2 already possessed of the space of this characteristic, I begin the passage on benevolence in the remainder of the page; which not containing the whole, I carry it on to page 3, which is also for *B e*; and add the number 3 in the index."

COMMON PLEAS, one of the king's courts, formerly part of the *aula regis;* but as this latter court was bound by its institution to follow the person of the king, and private persons experienced great difficulties in obtaining relief from a court that was ambulatory, and always in motion, it was made one of the articles of the great charter that the court of common pleas should thenceforward be held in a fixed place; and since that time it has been seated at Westminster. It is composed of a lord chief-justice, with three other judges; and appeals from its judgments, usually called *writs of error*, are carried before the court of king's bench. All civil causes, as well real as personal, are triable in this court, according to the law of the land. In personal and mixed actions it has an equal jurisdiction with the king's bench; but can take no cognisance of pleas of the crown. Thus informations, in which the king is plaintiff, and the suit criminal, can only be allowed or *granted*, in the king's bench.

[Common-pleas are usually spoken of as those suits which do not fall under criminal, chancery, orphan's court, or admiralty jurisdiction —T. C.]

COMMONS, *House of*, the popular branch of the legislature and government of Great Britain, and the basis of the British constitution. It is likewise the appellation by which the popular branch of the legislature of North Carolina is distinguished.

COMMONWEALTH, in a general sense, any form of government; in an absolute one, a republic. See REPUBLIC.

COMPANY, in a commercial sense, a society of merchants, mechanics, or other traders, joined together in a common interest. The mechanics of incorporated towns are thus erected into companies (See *Livery Companies*). The term is also applied to large associations set on foot for purposes of commerce. When companies do not trade upon a joint stock, but are obliged to admit any person properly qualified, upon paying a certain fine, and agreeing to submit to the regulations of the company, each member trading upon his own stock, and at his own risk, they are called *regulated companies;* when they trade upon a joint stock, each member sharing in the common profit or loss, in proportion to his share in the stock, they are called *joint-stock companies*. *Regulated companies* are entirely similar to the corporations of trades, and are a sort of enlarged monopolies of the same kind. As no inhabitant of a town can exercise an incorporated trade without first obtaining his freedom in the corporation, so, in most cases, no subject of the state can lawfully carry on any branch of foreign trade for which a regulated company is established, without first becoming a member of that company. The regulated companies for foreign commerce, at present subsisting in Great Britain, are the *Hamburg-company*, the *Russia-company*, the *Eastland-company*, the *Turkey-company*, and the *African company*.

COMPANY, *joint stock*, differs essentially, not only from regulated companies, but also from private copartneries. 1. In a private copartnery, each member may, upon proper warning, withdraw, and demand his share of the common stock, but he cannot introduce a member into the company; in a joint-stock company, his situation is the reverse: he cannot demand his share, but he may transfer it to another. The value of this share, moreover, is uncertain; being that which it will bring at market. 2. In a private copartnery, each partner is bound for the debts contracted by the company to the whole extent of his fortune; in a joint stock company, on the contrary, each partner is bound only to the extent of his share. The trade of a joint-stock company is always managed by a court of directors. [Hence they are never well managed, unless for the emolument of directors, and leading men. It may be laid down as an axiom, that every trading and manufacturing joint-stock company, whose business is entrusted to agents, must fail. Moreover, the principle of exonerating the private property of the persons concerned, is a FRAUD upon the public.—T C.]

COMPARATIVE ANATOMY, otherwise called the anatomy of beasts, and sometimes zoötomy, and named *comparative* in relation to that of the human body; a study which affords considerable advantages. 1. It conveys such knowledge of the different parts of animals as detects imposition in those au-

thors that have delineated and described parts of brutes as belonging to the human body. 2 It interprets several passages in ancient writers in medicine who have reasoned from those descriptions. 3. It casts considerable light, sometimes by similarity and sometimes by contrast, on the functions of the human frame.

COMPASS, or *mariner's steering compass*, is an instrument used at sea to direct the course of ships, by ascertaining the situation of a given point, and thence enabling the seaman to pursue a line in any direction to or from it. The European compass is contained in a circular box of brass, and consists of the magnetic needle, and a card marked with the 32 points, so fixed as to turn freely, and, together with the pin in the centre, yield to the motion of the vessel. In the centre of the needle is fixed a brass conical socket or cup, by means of which, the card hanging on the pin turns freely round the centre. The top of the box is covered with a glass, that the card's motion may not be disturbed by the wind. The whole is inclosed in a box of wood, where it is suspended by brass hoops, or gimbals, to preserve the card in an horizontal position. The utility of this instrument results from the magnetic virtue of the needle, through which it constantly places itself in a direct line from pole to pole; a small declination peculiar to various parts of the world, excepted. The compass appears to have been first known about the thirteenth century; but whether it was then discovered by a Neapolitan, a Frenchman, or an Englishman, or brought from China by a Venetian, is not wholly agreed. From some particulars mentioned in the account of the first British embassy to China, it seems reasonable to conclude that, at least, the Chinese did not receive this contrivance from Europeans. 1. The loadstone and its maritime use appears to have been anciently known to that people, because in a figure of Neptune, it is placed in one of the hands of the god, as we place a trident; 2. The Chinese pilots speak of the needle as pointing to the South pole, and Europeans as pointing to the North Both these expressions are equally just: but it commonly happens that when any thing of importance is borrowed from one nation by another, all the little attendant circumstances are taken with it. This latter argument equally maintains, with whatever conclusiveness it possesses, the originality of the European compass: Mr BARROW, however, a gentleman who attended the embassy, has made some observation, from which it appears, that that of the Chinese is the more perfect of the two. He describes a sort of bandage of copper, by means of which the declination or variation of the needle is prevented. See MAGNETISM.

COMPASS, *Azimuth*, an instrument used for correcting the mariner's compass, or at least, for ascertaining its variation, by finding the sun's magnetical azimuth or altitude.

COMPENSATION is a contrivance in a pendulum clock, by means of which, while the expansion from increase of temperature depresses the centre of gravity of some of the vibrating parts, other parts are made to ascend nearer the centre of suspension, or to draw up the pendulum, so as to preserve the centre of oscillation of the compound pendulum at an invariable distance, and in consequence to keep all the vibrations to the same time. Compensation balance in a watch is a contrivance by means of which the errors occasioned by the variation of temperature may be corrected by varying the diameter of the balances.

COMPLEMENT *of Life*, a term used in the doctrine of annuities by DE MOIVRE, who denotes by it the number of years which a given life wants of 86, this being taken as the utmost probable extent of life Thus to a person aged 20 the complement of life is 66: to a person aged forty, the complement of life is 46 Upon this mode half the complement of life is that which persons not very young nor very old, may expect to enjoy, thus to a person of 20 the expectation of life is $\frac{66}{2} = 33$ years, and to persons of 30 and 40, the expectation of it will be $\frac{56}{2}$ and $\frac{46}{2} = 28$ and 23. To find how long a person of a given age may expect to live, that is, the number of years which persons of this age, taking them, one with another, will actually enjoy, and may be considered as sure of enjoying, those who live beyond that period enjoying as much more time, in proportion to their number, as those who fall short of it enjoy less. Rule "Take the given age from 86 and divide the remainder by two." Life annuities and the expec

tation of life are not calculated in this way now, but from tables of real observations, nevertheless, the rule just mentioned agrees nearly or within a few months with the deductions taken from such tables, and may always serve in rough calculations. See ANNUITY.

COMPLEMENT, in astronomy, the distance of a star from the zenith, or the arch comprehended between the place of the star above the horizon and the zenith.

COMPLEMENT, in geometry, is what remains of a quadrant of a circle, or of 90° after any arch is taken away.

COMPLEMENTS of a parallelogram, are the two smaller parallelograms made by drawing two right lines through the point of a diagonal and parallel to the sides of the parallelogram.

COMPLEXION, among physicians, the temperament, habitude, and natural disposition of the body; but, in general use, the word means the colour of the skin. Dr Hunter has given the following view of the different complexions observable among mankind.

BLACK.

Africans under the line,
Inhabitants of New Guinea,
Inhabitants of New Holland.

SWARTHY.

Moors in the north of Africa,
Hottentots in the south of Africa.

COPPER COLOURED.

East Indians.

RED COLOURED.

Americans.

BROWN COLOURED.

Tartars,
Persians,
Arabs,
Africans on the coast of the Mediterranean,
Chinese.

BROWNISH.

Inhabitants of the south of Europe,
Sicilians,
Abyssinians,
Spaniards,
Turks; *and likewise*
Samoides *and*
Laplanders.

WHITE.

Most of the European nations; also the Georgians and
Inhabitants of the islands of the Pacific Ocean.

Those of our readers who may wish to see these observations farther pursued, we must refer to an ingenious *Essay on the Causes of the Variety of Complexion and Figure in the Human Species*, published a few years since by the late Dr. S. S. SMITH, President of the College of New Jersey. They will also find some excellent strictures on this subject in Mr CLARKSON's elaborate *Essay on the Slavery and Commerce of the Human Species.*

[All this is said very decisively on a very difficult subject. Dr SMITH's plausible but superficial book, has been destroyed in all its conclusions by Dr. CALDWELL's examination of it, in the Port Folio. Has it ever been known that climate has turned a white man into a negro, or a negro into a white man? The copper colour of the American Indians prevails through all climates from the Esquimaux to the Mexicans.—T. C.]

COMPOSITE ORDER. See ARCHITECTURE.

COMPOSITION, *in Agriculture.* The following is a valuable composition, recommended by FORSYTH. Take one bushel of fresh cow-dung, half a bushel of lime rubbish of old buildings, (that from the ceilings of rooms is preferable), half a bushel of wood ashes, and a sixteenth part of a bushel of pit, or river sand. The three last articles are to be sifted fine before they are mixed; then work them well together with a spade, and afterwards with a wooden beater, until the stuff is very smooth, like fine plaster used for the ceiling of rooms. Where lime rubbish cannot easily be procured, pounded chalk, or common lime, after having been slacked a month, may be used. If any of the composition, after using it, be left for a future occasion, it should be kept in a tub or other vessel, and urine of any kind poured on it, so as to cover the surface.

The mode of applying this composition has been already noticed under the articles Apricot, Apple-tree, and Canker, but it may be well to state it more particularly in the present place.

All dead, and injured parts, must first be taken away, and the sound fresh wood laid bare, leaving the surface of the wood very smooth, and rounding off the edges of the bark with a draw knife, perfectly smooth, then lay on the plaster 1 8 of an inch thick, and take a quantity of dry powder of wood ashes mixed with a sixth part of the same quantity of the ashes of burnt bones, put it into a tin box with holes, in the top, and shake the powder on the surface of the plaster, till the whole is covered over with it, letting it remain for half an hour, to absorb the moisture; then apply more powder, rubbing it gently with the hand, and repeating

the application of the powder till the whole plaster becomes a dry smooth surface.

COMPOSITION *of motion*, is an assemblage of several directions of motion, resulting from several powers acting in different, though not opposite directions. See MECHANICS.

COMPOST, in agriculture, is a certain mixture designed to promote vegetation, instead of dung. To effect this purpose, various experiments have been made. Of these experiments not one has answered in practice. Dr. HUNTER's oil compost is to be met with only in his Georgical Essays. Dung is profitably mixed with earth, and the water that would otherwise escape from dunghills is profitably soaked up by earth. Dung thus mixed is also more equally distributed over the fields. This is the only kind of compost that practical farmers have yet adopted.—T. C.

Mr. WILLIAM WEST, of Delaware county, (says Dr. MEASE) has been of infinite service in shewing what great advantages the neglected weeds of the field and fence sides, and the leaves of the woods, may produce, if properly attended to and converted into manure.

Mr. WEST directs the yard where the compost is to be made, to be considerably *concave*, and the bottom laid over, four or five inches deep, with the toughest clay, and this stratum to be covered with strong gravel, well pounded in, to prevent its removal when the manure is taken out In this yard he directs to hawl, in the autumn, a quantity of earth taken from the top or under surface, and of the quality adapted to the land to be manured. That is, if a sandy and open soil, he takes clay, and if clayey, sandy soil. He cuts down all the weeds about the farm before they seed; and, together with the leaves from the woods, hawls them into the yard, where they receive a sprinkling of lime, to promote their putrefaction, and are formed into a heap with the stable dung, and enriched by the urine which flows from the cattle stalls.

If the proportion of stable manure be much less than the other materials, the quantity of lime may be increased, in order to favour the decomposition of the vegetable matter This will take place in about one year, when the manure may be hawled out to the ground requiring it. Much time may also be saved by the farmer making a compost heap on the head lands of fields intended to be manured; for this purpose the weeds, leaves, mud from creeks or swamps, and waste hay, may be collected in a heap, mixed with lime, dung from the fields, and earth from the head lands One faithful mixing is sufficient; for, as Mr. BORDLEY justly observes, often turning the compost may weaken it as a manure, by checking the fermentation of the mass. In this way a diligent farmer may greatly increase the richness of the land, at the same time that he rids his fields of noxious weeds and briers. Several heaps of compost of different qualities, according to the nature of the soils requiring a dressing, may be made either in the field, or in the barn yard. As the water drains from them, it should be carefully collected and thrown on the heap. And that it may not be lost by soaking in the ground while the farmer is necessarily occupied in attending to other matters, wooden troughs or gutters, paved with clay and gravel, well pounded, or with lime and gravel mixed with boiling hot lime wash, and spread with a trowel, may be made to convey the liquid to a tight barrel sunk in the ground; whence it may be thrown upon the heap at a leisure time. See MANURE.

[To all this I would object, that it is a system too complicated to be extensively practised, and unless the heat of the fermentation be sufficiently strong to destroy the vegetable life of the seeds of the weeds, which, if earth be mixed with the dung, and a compost formed, is seldom the case, it is a very good method to fill the soil full of weeds. Weeds containing seeds, should either be burned, or put into the middle of a large dunghill to be killed by the fermentation, or by lime.

The most economical compost is, one fourth dung, one fourth weeds, one fourth common earth, and one fourth fresh burnt and fresh slacked lime, about ten loads to the acre —T C]

COMPOUND INTEREST. See INTEREST.

COMPRESSES, in surgery, are very useful applications, for preventing a wound from bleeding, or swelling, as well as in the treatment of aneurisms, ruptures, and *indolent* tumours of every kind. They generally consist of folded pieces of linen cloth, so contrived as to make a gentle pressure upon any particular part. After the plaster and other dressings are applied, surgeons frequently cover the whole with a *compress*, to secure and fix their applications, and to preserve the parts from the injuries of external air, which would retard the process of healing.

Compresses are likewise frequently used, where no plasters are required; and in this case, either dry, or moistened with certain liquors, which are supposed to be strengthening, emollient, cooling, &c. For such purpose, they are dipped into decoctions of different herbs, into wine, spirits, vinegar, lime-water, solutions of water, sal ammoniac, &c. either hot or cold, according to the nature of the case. But the principal use of compresses appears to be that of filling up any cavity or depression of the parts, so that the dressings, especially in fractures, may be applied with greater security; and to prevent the bandages from occasioning a troublesome irritation or other pain, and uneasiness on the skin. Hence they ought to be cut out in circular pieces, nicely adjusted to the diseased parts, and each of them progressively increasing in diameter.

CONCENTRATION, the act of increasing the strength of fluids, either by evaporating the water with which spirits or acids are combined, or by exposing them to severe frost, when the water will be frozen and the acid or spirits will be found in the middle of the ice

CONCHOLOGY, the study or science of shells or testaceous animals, is a branch of natural history. Shells may be said to constitute a department of rational enquiry worthy the researches of the man of science; and when we consider the amazing diversity of singular and beautiful objects that they embrace, they are such as cannot fail to arrest. in a particular degree, the regard of every observer. The term conchology, comprehends the study of animals which have a testaceous covering, whether inhabitants of the land or the water Testaceology is a term synonymous with chonchology, but is of later origin and application. All testaceous animals are composed of two parts, one of which, the animal itself, is soft and moluscous: the other is the shell or habitation, which is hard, of a stony or calcareous nature, and either partially or entirely covers the animal. The animal is attached to the shell by means of ligaments or muscles. It was long considered as a matter of dispute among naturalists whether the arrangement of shells should be constituted from the animals or their habitation. There is much difficulty in either plan of proceeding; but the latter is now generally adopted, because it is certain that the best characters upon which to found all systems of natural history, must be those most obvious and accessible. All ranks of animals, as nearly as can be with convenience, should be arranged by apparent and external characters.

All shells or testaceous bodies hitherto discovered, may be divided into three principal tribes, which may be denominated univalve, bivalve, and multivalve. Any external part of a shell being of a testaceous substance, and either itself forming a shield or covering for the animal, as in univalves, or in union, with one another, or others connected with a ligament, cartilage, hinge, teeth, or other fastening, is denominated a valve. The shells therefore, consisting of a single piece are called univalves, those of two parts bivalves, and those of many parts multivalves. Between bivalve and multivalve no distinction is drawn, shells consisting of more than two such parts being called multivalve, without any regard to the number. LINNÆUS begins with the multivalves and the most complex structure, and ends with those of the simplest form. According to this naturalist the multivalves contain, the chiton, lepas and pholas: the bivalves contain the mya, solen, tellina, cardium, mactra, donax, venus, spondylus, chama. arca, ostrea. anomia, mytilus, and pinna: and the univalves contain the argonauta, nautilus, conus, cypræa, bulla, voluta, buccinum, strombus, murex. trochus, turbo, helix, nerita, haliotis, patella, dentalium, serpula, teredo, and sabella. See SHELL, TESTACEA.

CONCRETIONS, morbid, in animal economy, hard substances that occasionally make their appearance in different parts of the body, as well in the solids as in those cavities destined to contain fluids: in the first place they are denominated concretions or *ossifications*; in the other *calculi*.

CONDUCTORS, are long rods made of iron or other metal, employed for protecting buildings from the effects of lightning.

The utility of conductors is universally acknowledged, yet it has not been ascertained, till within these few years, whether pointed or blunt ones were the most proper: the former, however, are now decidedly preferred, in consequence of several experiments, made under the inspection of the Royal Society. Instances, nevertheless occur of houses provided with pointed metallic conductors, being stricken with

lightning; so that this philosophical contrivance has not yet arrived at perfection. We, therefore, communicate with satisfaction the following improvement in conductors, made by Mr. ROBERT PATTERSON, of Philadelphia, for which the American Philosophical Society adjudged him the prize of a gold medal. He proposes first to insert, in the top of the rod, a piece of the best *black lead*, about 2 inches long, and terminating in a fine point which projects a little above the end of its metallic socket; so that if the black-lead point should by any accident, be broken off, that of the rod would be left sharp enough to answer the purpose of a metallic conductor. [Conductors tipped with platina are the best —T. C.] His second intention is, to facilitate the passage of the electric fluid from the lower part of the rod into the surrounding earth. In many cases it is impracticable, from the interruption of rocks and other obstacles, to sink the rod so deeply as to reach moist earth, or any other substance that is a tolerably good conductor of electricity. To remedy this defect, Mr PATTERSON proposes to make the lower part of the rod, either of tin or copper, which metals are far less liable to corrosion or rust, than iron, when lying under ground; or, which will answer the purpose still better, to coat that part of the conductor, of whatever metal it may consist, with a thick crust of black-lead, previously formed into a paste, by being pulverised, mixed with melted sulphur, and applied to the rod while hot By this precaution, the lower part of the rod will, in his opinion, retain its conducting powers for ages, without any diminution

In order to increase the surface of the subterraneous part of the conductor, he directs a hole, or pit, of sufficient extent, to be dug as deep as convenient; into which a quantity of *charcoal* should be put, surrounding the lower extremity of the rod. Thus, the surface of that part of the conductor, which is in contact with the earth, may be increased with little trouble or expense; a circumstance of the first importance to the security against those accidents, as charcoal is an excellent conductor of electricity, and will undergo little no change of property, by lying in the earth for a long series of years.

The experience of every year convinces us that metallic conductors, or lightning rods, are not certain safeguards against lightning: it is of infinite importance, therefore, to state a certain mode by which all *possible* danger may be avoided, this we are enabled to do from the directions given by the late G. C. MORGAN, in his lectures upon electricity; (Norwich, 1794) and the editor is happy in stating, that the method was highly approved of by that distinguished philosopher, Dr. PRIESTLEY, and was the one which he constantly recommended in England, when consulted on the occasion

The foundation of each partition wall of the house must be laid on a strip of lead; or the lead must be fastened to the sides of them. These strips must be connected, and their dimensions not less than one-fourth of an inch thick, and 2 inches wide. A perpendicular strip on each side of the house, should rise from this bed of metallic conductors to the surface of the ground: there a strip should be continued around all the house, and carefully connected with water pipes &c The strips on the sides of the house should then be continued to the roof, where the method of guarding the bottom must be imitated. The top is to be surrounded by a strip, whose connexion should spread over every edge and prominence, and hence must continue to the summit of each separate chimney.

The chimnies in particular must be protected, for Mr. MORGAN was witness to a case in which a house was guarded, in most respects, according to the method just described: but from the chimnies having been left unprotected, the lightning consequently struck one of them, where its age terminated, but the tumbling of the chimney into the roof was attended by serious consequences. By guarding the house, we make it of all objects, that which is the most likely to become the circuit of a cloud; and consequently should be careful that no interruption divides the conductors, for the havoc will probably take place.

The expense of a conductor, erected according to the plan described, may be considerably lessened, by making a proper use of the leaden pipes and copings which belong to most houses; no other skill being requisite, than that of fastening the strips of lead, so that they may be secure, and at the same time be connected with each other

Ships may be also easily protected One strip of metal should surround the deck; another should be fastened to the bottom, or the side of the keel; these strips should be connected with

others which embrace the ship in different parts.

If the vessel be copper-bottomed, nothing more is necessary than to connect the metal which surrounds the deck with the copper, but in both cases, a separate strip should pass from the rest of the strips to each mast; no injury can then possibly happen below deck. This is a circumstance of considerable importance; for the conductors which are usually designed for the masts, are moveable, and injury has often been the consequence of neglecting to place them in their [illegible] situation.

The protection of the masts must be managed by extending a metallic body along the stays to as great a height as possible. Chains are frequently employed for this purpose; but strips of lead are cheaper; they are not separated by any interruptions; they are not so liable to injury from the weather and salt water as iron is, and might be fastened without annoying any necessary movement.

CONE, a kind of round pyramid, or solid body, having a circle for its base, and its sides are formed by right lines drawn from the circumference of the base to a point at top, being the vertex or apex of the cone. Or a cone is a solid figure, whose base is a circle, and which is produced by the entire revolution of a right angled triangle about its perpendicular leg. See MENSURATION.

CONFERVA, a water plant.

CONGELATION, may be defined the transition of a liquid into a solid state, in consequence of an abstraction of heat: thus metals, oil, water, &c. are said to congeal when they pass from a fluid into a solid state. With regard to fluids, congelation and freezing mean the same thing. Water congeals at 32°, and there are few liquids that will not congeal, if the temperature be brought sufficiently low. The only difficulty is to obtain a temperature equal to the effect; hence it has been inferred that fluidity is the consequence of caloric. See FLUIDITY.

CONIC-SECTIONS are such curve lines as are produced by the mutual intersections of a plane and the surface of a solid cone. In different positions of the plane there arise five different figures or sections, viz. the triangle, the circle, the ellipse, the parabola, and the hyperbola: the last three are peculiarly called Conic Sections, to investigate the properties of which is the business of Conics, and this depends on a knowledge of geometry, plane and solid.

CONSTELLATION, an assemblage or system of several stars, expressed or represented under the name and figure of some animal or other thing. The division of the starry heavens into constellations is very ancient, probably as old as astronomy itself. Modern astronomers divide the whole starry firmament into three parts, viz 1. The constellations in the Zodiac. 2. Constellations north of the Zodiac, and 3. Constellations south of the Zodiac. The constellations in the Zodiac are Aries: Taurus: Gemini: Cancer: Leo: Virgo: Libra: Scorpio: Sagittarius: Capricornus: Aquarius, and Pisces: the names and order of these 12 signs may be easily remembered by the aid of the following lines:

The ram, the bull, the heavenly twins
And next the crab the lion [illegible]
The virgin and the scales,
The scorpion, archer, [illegible]
The man that holds the wa[illegible]
And fish with glittering [illegible]

[CONSTITUTION, is [illegible] temperament of the body, which [illegible]pends much on habitual [illegible] In England, since tea has banished ale from the breakfast-table, since vegetables have been used in greater abundance, and animal food more sparingly, inflammable diseases are of less frequent occurrence, and the typhoid form of disease more frequent. There can be little doubt but we are gainers upon the whole, in point of health. We hear nothing now of the sweating sickness, the falling sickness, the plague, &c and although tea and spirits may be abused, the prevailing forms of diet are, upon the whole, an improvement upon those of two centuries ago. The best of all diet for debilitated constitutions, is milk and unfermented crackers or biscuit. This has been tried often enough to establish its great utility, but the patient must be confined to this diet for *at least* one year; nor will it admit of occasional aberrations. Two quarts of milk, and a dozen crackers per day, would be a full allowance.—T. C.]

[CONSTITUTION, in politics, is a set of fundamental principles and regulations, framed and expressed by the people, by means of representatives for this purpose expressly convened, which are to serve as the ground-work of all future executive, legislative and judicial power, derived from the constitution thus enacted. It would be expedient to

revise every constitution thus enacted, once in thirty years. We know of no regularly framed constitutions but those of North America.—T. C.]

CONSUMPTION, in medicine, is a very comprehensive term, including all those diseases, in which the body, from defect of nourishment, is gradually reduced to a state of debility and emaciation. This fatal disorder may arise from a great variety of causes, such as a mal-conformation of the trunk; straitness of the chest; intemperance of whatever kind; obstructions in the pulmonary vessels; suppression of any natural evacuations; as likewise in consequence of pleurisies, coughs, catarrhs, diarrhœas, grief, intense study, &c. More frequently, however, it originates from a neglected cold, especially in constitutions where a peculiar hereditary disposition prevails, without any other discoverable cause. [illegible] bee[illegible] alarming increase of consump[illegible] next [illegible] an ample field for medi[illegible] an equ[illegible] It is no less astonish[illegible] been [illegible] true, that about *one-third* of who ha[illegible] di[illegible] in London, fall victims [illegible] less disease, if the bills of mortality [illegible] taken as the basis of that calculatio[illegible] In the three years of 1796, 1797, and 1799, the number of deaths, in the British metropolis, is stated to be 52,237; and among these were, under the general head of consumptions, 17,559. Although the framers of these bills have probably classed many other *chronic* disorders under the head of *decline* and *consumption*, so that, perhaps, one-half, may be fairly deducted from their statement, and referred to other maladies, yet even the remaining number of about 3000 annually, in London alone, is sufficient to serve as a warning to every parent, and head of a family, in order to avoid those *causes* which we have before recited.

So many books have been written upon this common disease, that it would seem impossible to say any thing new on it. It may be well, however, for the editor (Dr. Mease) to add a few general remarks, which are the result of experience, and of a particular attention to this complaint.

It must be observed, that the true consumption only, is alluded to: the general wasting of the body arising from a gradual decay of the powers of nature, or from a course of intemperance or debauchery, or from other causes, more properly belongs to the article "Atrophy."

far the greater part of all true consumptions arise from *neglected colds*. A cold is therefore never to be trifled with, but should be attended to with the greatest care. If a fever, and a sense of fulness attend, small bleedings, (viz. 6 to 8 oz.) should be prescribed, frequent doses of nitre (10 gr. three times a day) and purges of Glauber's salts, or *soda phosphorata* taken, dissolved in gruel, together with diluting drinks of barley or rice water, or infusion of flaxseed in boiling water, and sweetened with honey; and small doses of laudanum.

Confinement to a room of a temperature as equal as possible, is of great consequence. The diet should be more sparing than usual, for the first days: after which the accustomed mode of living, (if temperate) may be resumed.

By this plan of proceeding, most catarrhs, which very commonly are suffered to distress a person for weeks, may be easily cured.

But should it happen that a cold has been neglected, and symptoms of consumption appear, small bleedings must be repeated every four or five days, low diet used, gentle purges of the neutral salts above mentioned taken, together with small doses of nitre, and a free use of demulcent drinks above referred to, jelly of calves feet dissolved in water: refined liquorice, or sugar candy, may also be frequently dissolved in the mouth and will greatly assist in allaying a teasing cough. Much benefit has been derived from two or three drops of laudanum taken three times a day in a small quantity of liquid, by allaying the cough without heating the system. But the great point to be attended to, is the *preservation of an equal temperature in the atmosphere which the patient breathes*. A frequent alteration of heat and cold is *death* to an irritable consumptive system. Hence, if convenient, the consumptive patient should remove to the state of Georgia, in the month of November, if the attack has taken place before that time; or he may visit that mild climate any time during the winter, should the symptoms make a formidable *appearance*, (which they sometimes do,) after the cold weather has commenced. It is to be regretted, that this change of climate is often delayed until a late period of the disease, when the strength is so much exhausted that sufferers cannot take sufficient exercise to assist the climate in restoring health. Whereas, did they remove from our variable climate early in the complaint, they would be enabled to

join the important advantages of a mild climate with regular exercise. Where a change of climate cannot be effected, the uniformity of the temperature in the sick person's room day and night, ought to be carefully preserved: for this purpose a south exposure is highly favourable.

Very great mischief has been done by authors on the consumption, who have servilely copied each other, and considered the complaint as *originating* in the *lungs*, and as always appearing with an *uniformity* of *symptoms*. It is with an honest pride we are enabled to state that it is to the United States the world is indebted for the discovery of the important principles upon which the cure of this formidable complaint is to be founded Dr RUSH of Philadelphia first asserted that the consumption was originally a disease of the *whole* system and not of the lungs solely, and pointed out the great, the INDISPENSIBLE necessity of regulating the remedies by an attention to the form which the disease assumes, that is, whether it be accompanied by inflammatory symptoms or by those of debility Nay, it frequently appears with great muscular debility, and at the same time the pulse is so tense and corded, and the breathing so difficult as to prove the laborious transmission of the blood through the lungs, and to render a small bleeding essential, in order to prevent the progress of inflammation, and the formation of tubercles. The treatment must be therefore varied with the symptoms; thus gentle tonics, and light nourishing aliments and exercise taken when the disease puts on the appearance of debility; and mild evacuations, low diet, and rest, enjoined when inflammatory symptoms come on A more particular account of the complaint cannot be given consistently with the plan of this work; the reader is therefore referred to Dr. RUSH's works, for an original and important paper on this disease, containing directions of conduct, both as to medicine and diet, in the various forms which this complaint puts on.

The *digitalis purpurea*, or purple fox glove, has of late been much praised in the consumption. It has done some good, and has also done much harm, in consequence of being given without due attention to the *state of the system*, at the time of its exhibition. The digitalis produces very powerful effects upon the pulse, which it diminishes both in force and frequency in a remarkable manner, and hence ought never to be given, unless inflammatory symptoms are present But the discussion of the points to be attended to, in the use of this powerful medicine must be deferred until we come to the article DIGITALIS

CONTAGION. By contagion commonly understood, a specific [illegible] ter generated in persons in a diseased state, and capable of communicating the particular disease to another person by approaching within the sphere of its influence

In some cases it is conveyed by immediate contact or touch; in others, by infected clothes. such as cotton, and particularly wool, which of all substances is the most susceptible, because it is extremely porous. Contagious matter is also, though we apprehend erroneously, said to be transmitted thro' the air, at a considerable distance, by means of effluvia arising from the sick, in which case the atmosphere is said to be infected.

To obviate as far [illegible] all infection, we would recommend to those who are obliged to attend patients, never to approach them [illegible], which [illegible] while they are in their [illegible] ent, to avoid both eating and drinking, and also the swallowing of their own saliva. Nor will it be altogether useless to chew myrrh, cinnamon, and similar drugs, which promote a plentiful discharge from the mouth. As soon as a person has returned from visiting an infected patient, he ought immediately to wash his mouth and hands with vinegar; to change his clothes, carefully exposing those he has worn to the fresh air; and then to drink a warm infusion of sage, or other aromatic herbs, which tends to excite a gentle perspiration. It will also be of considerable service to those who are employed about sick persons, frequently to smell vinegar and camphor, or to fumigate the apartments with tobacco

Dr. WILLICH (says Dr. MEASE) has given some uncommon good directions for avoiding contagion. But with regard to the vinegar and camphor, our experience is by no means confirmed in the United States. When a person is exposed to contagion, besides attending to the general rules laid down by Dr. WILLICH, attention should be paid to the bowels, which must be opened regularly every day once or twice, by laxative articles of food, as roasted apples, prunes, or molasses and water The diet should be light, and nothing difficult of digestion taken. New articles of food, dishes of new cooking, and

fresh bread, ought to be avoided. If the bowels are not moved by the diet used, clysters composed of a quart of warm water, one tea-cupful of sweet-oil, and one of molasses, ought to be injected daily, by means of a pewter syringe. Purgatives taken by the mouth are apt to derange the stomach, and it is of *immense consequence to preserve this organ in its usual degree of tone One single day's excess may defeat the care and precaution of a month*

Exciting causes of fever, such as exposure to night air, to a hot sun, or to sudden changes in the atmosphere, intemperance, late hours, and all causes of passion, ought to be avoided with the utmost care. An extraordinary fear of sickness must be dispelled, if possible, by reading cheerful books, and by some constant employment of the body or mind But probably as powerful a remedy as any that have [illegible] a flannel shirt worn [illegible] This will keep up [illegible] perspiration, and has [illegible] of essential benefit to those [illegible]en exposed to contagious [illegible] obliged to reside in a pes[illegible]sphere It has been found [illegible] during the prevalence of [illegible]ht fever which has so re[illegible] since 1793, distressed the city of Philadelphia, particularly in the autumn, when the coolness of the mornings and evenings is considerable, and frequently excites the fever in those who are exposed at that time, and are not warmly clad.

A respectable physician of Philadelphia thinks he owes his escape during several epidemic fevers, to the irritation produced by a blister on the wrist, which he kept open. Medical men will understand the theory of the action of this remedy, which ought certainly to be tried, when an escape from the place of pestilence cannot be effected.

[Contagion should be distinguished from infection. The former exists in the atmosphere surrounding a patient, the latter requires actual contact. Dr. RUSSEL ascertained that the plague was not contagious beyond six feet from the infected person. The yellow fever is not contagious in an atmosphere perpetually changed. Hence it is not contagious in the country, when it is so in close rooms, and in the close streets of a city Contagious miasmata may be accumulated in a given space. The anti-infectious mixture of MORVEAU by disengaging chlorine gas in an infected apartment, and even that of the London Pharmacopœia by discharging nitrous gas by means of pouring oil of vitriol on nitre in a tea cup, have experience in their favour

Chlorine may be disengaged thus; in a large tea cup or basin put three oz. of common salt, one ounce either of manganese or red lead, one ounce measure of water, and then as much oil of vitriol as of water. Stir the mixture with a tobacco pipe, and get out of the room quickly, and shut it up close. In an hour return. It will corrode metallic substances by the fumes extricated, so that these should be first removed.

Anti-contagious mixture for a room 40 feet by 20 Take 15 oz of common salt; 3 oz. of manganese; 8 oz. of water mixed with the drugs; then add 8 oz. oil of vitriol. Leave it in a china bowl for ten hours.—T. C]

CONVOLVULUS Some species of this genus have already been noticed under the article BINDWEED. There are several more species, natives of the United States; at present the *C. Panduratus* only will be noticed. It is called *Wild Potatoe* in Carolina The root is perennial, thick and long, like that of a carrot. Capsule two-celled and two-seeded This species grows very plentifully about Bethlehem; the roots are purgative, and are collected and sold, according to SHOEPF, for *mechoacanna*. They are said to be escharotic, and useful to take down proud or fungous flesh in sores.

CONVULSION. A disease attended with irregular and unnatural contraction of the muscles without sleep. It differs from *epilepsy*, in being accompanied neither with any mental affection, nor with a state of torpor.

The *causes* of convulsions are not always evident, though they generally depend on a certain irritability of the nervous system. Delicate hysteric women, and men disposed to hypochondriasis, are equally subject to this disorder. Frequently, however, convulsive symptoms take place in consequence of wounds, irritations of the stomach and intestines, worms, poisons, violent cathartics, emetics, &c.

Convulsions are frequently occasioned among children by indigestible food, or other substances, in the stomach, which is no sooner removed either spontaneously, or by means of an emetic than all the alarming symptoms disappear; and without this, every medicine will fail of procuring relief. Food

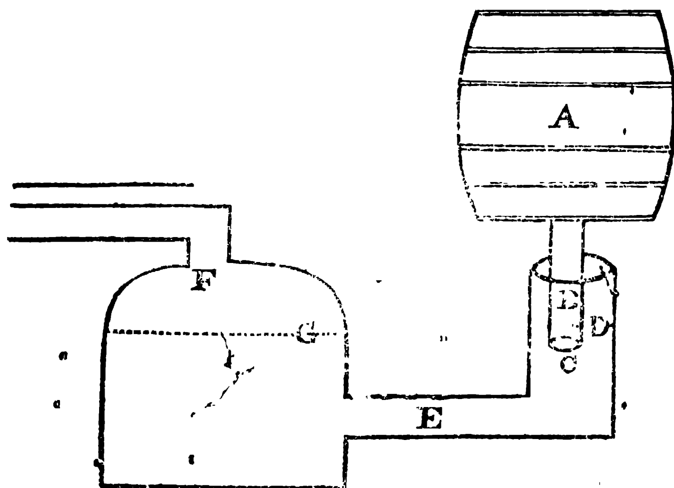
will often remain many hours undigested, before it produces any bad effects. I have known a piece of *cheese-cake* lie in the stomach two days without the appearance of any bad consequences: but at the end of that time *convulsions*, and the most alarming faintings, alternately followed, nor did they cease until the *cheese-cake* was discharged, when by the help of an anodyne every symptom of disease vanished. [To these observations of Dr. MEASE, I would add, that convulsions are generally owing to worms in the intestines.—[illegible] C.]

COOKING, the art of [illegible] or preparing food. It is effected by various methods, of which *boiling* is the most common, but also the most objectionable; as it deprives flesh of its nutritious juice. A better mode of dresssing animal food is *roasting*, by which its strength is less dissipated; because a crust is soon formed on its surface, that more effectually preserves the nutritive particles from evaporation. Hence, one pound of roasted meat is, in real nourishment, equal to double that quantity of boiled animal food.

Many substances, though naturally possessed of salubrious qualities, are rendered unwholesome, by the refinements of cookery. By compounding several incongruous ingredients, to produce a poignant sauce, or rich soup, the cook frequently forms compositions that are almost poisonous. Thus, high seasoning of every kind, pickles and the like, merely stimulate the palate, and cannot fail to injure the stomach. Hence, the plainest dishes are uniformly the most conducive to health, while they are most easily digested. This self-evident proposition is acknowledged by every reflecting person, but gives the least satisfaction to the epicure, who consults his taste, before he appeals to his warped understanding.

Animal food is generally boiled in half-open vessels, instead of which, close utensils only ought to be employed for that purpose. We therefore preferably recommend the process called *stewing*; as it is not only the most wholesome mode of dressing meat, but at the same time well adapted to retain and concentrate the most substantial parts of animal food. The utility of preparing victuals after this method, having been generally acknowledged, various patents have been granted to persons for the invention of machinery, by which that object may be attained at the smallest expe[illegible]. Of these [illegible] shall communicate the [illegible] the better illustration [illegible] all in- subjoined a cut. [illegible] to the[illegible]

A patent w[illegible] granted, in De[illegible] 1793, to Mr STANLEY H[illegible] which [illegible] Paul's Church-yard, iro[illegible] for his invention of a machi[illegible] which he calls a *Pneumatic Kitchen*, for cooking provisions by steam; in such a way, that no complex machinery is required for supplying the boiler with water, to re-place the quantity dissipated by evaporation, nor any pump (the boiler being constantly supplied during the evaporation, without the aid of a cistern).



which apparatus may be fixed at a small expense, without any alteration of the chimney; and, when once arranged, requires no repair. The steam-boiler, and cooking-vessels, being made in the usual way, the former is to be supplied with water by a fountain-reservoir, marked A, which is to be placed at a convenient distance from it, with its discharging tube, marked B, inserted, in a cistern, or pipe, marked C; in which the surface of the water will, by means of the fountain, be preserved always at one height, pointed out by the letter D: and by a communication marked E, from the said cistern or pipe, with the steam boiler, marked F, the water therein will, during the evaporation, be preserved at a height corresponding with such cistern or pipe, and always at the same level, marked G. By means of the fountain above mentioned, the necessity of cocks and bee [illegible] or pumps, for supplying the [illegible]; and the supply ren[illegible] immediate, more certain, an equ[illegible] me more simple, than en fo[illegible] ntrived. The [illegible] ny materials, [illegible] suited to the purpose.

[Note [illegible] llowing experiments.

[illegible] pie[illegible] eef weighing 280 *lb* lost [illegible] or 26½ per cent. in *boiling*.

[illegible] s beef weighing 190 *lb* lost 61 *lb* 2 *oz* or 32 per cent. in *roasting*

9 pieces beef weighing 90 *lb.* lost 27 *lb.* or 30 per cent in *baking*.

27 legs of mutton weighing 260 *lb.* lost 55 *lb.* 8 *oz.* or 21 1-3 per cent. in *boiling*.

The shank bones were taken away.

19 loins of mutton weighing 141 *lb.* lost 49 *lb.* 14 *oz* or 35½ per cent. in *roasting*.

10 necks of mutton weighing 100 *lb.* lost 32 *lb.* 6 *oz* or 32 1-3 per cent. in *roasting*

Hence, those who roast, bake, or broil their meat throw a great part of it away. So do those who boil it, and throw away the liquor, which should be thickened with stale bread, or flour, and made into broth, or soup, with some vegetables, salt, and pepper.

All cooking is done cheapest, not by means of wood, but charcoal of wood over fixed or portable furnaces adapted to the size of your pot: the French stoves for charcoal, about 4 inches deep, in use in every French kitchen, ought to be in use in every American kitchen. All broiling, stewing, baking, and boiling, is thus performed with more economy in fuel—more neatly—more accurately—with less damage to the eyes—over small charcoal fires than in any other way. I have ascertained, that charcoal used, and not wasted, will save three fourths of the expense of cooking in a kitchen. Of this more at large hereafter.—T. C.]

CONSUL, in commerce, an officer appointed to reside in foreign countries, to protect the interests of trade. He is to act as a common friend to such of his mercantile countrymen as visit his station. His house is distinguished by the arms of his government placed over the door.

[COOLERS. The Egyptian wine-coolers are said to be made with clay, mixed up with water, in which common salt is dissolved. The fire must not be so strong as to fuse the salt and convert it into a glazing. By degrees the salt is washed out, and the vessels acquire the necessary porosity.

The best coolers for preserving ice, are double tin, with an inch of finely powdered charcoal between the inside case, that holds the ice and the decanter, and the outside. The cover also should be made on the same principle, which I have successfully tried.—T. C.]

COOPER, a maker of casks. This hard-working business has several branches. Some casks are tight, for holding liquids, and others not so, for dry goods, package, and soap. The making of soap-casks is the lightest labour, and requires the least capital; that of small light casks is more laborious, and demands a larger fund; that of butts, hogsheads, and large vessels for brewing and other extensive purposes, stands, in both respects, the highest in the scale.

COPAIBA, or BALSAM of COPAIBA, a liquid resinous juice, issuing from incisions made in the trunk of the *Copaifera Balsamum*, L. a tree growing in the Spanish West Indias, of which there is only one species.

The juice is clear and transparent, of a whitish or pale yellowish colour, an agreeable smell, and a bitterish pungent taste. It is usually about the consistence of oil; when long kept, though retaining its transparency, it becomes nearly as thick as honey; and, unlike other resinous juices, does not acquire a solid state.

Genuine balsam of copaiba dissolves entirely in rectified spirits, especially if a little alkali be previously added to the liquor: the solution has a very fragrant smell. When distilled with water it yields a large quantity of a limpid essential oil: and in a strong heat

without addition, an oil of a blue colour

With respect to the medicinal properties of this balsam, it is said to strengthen the nervous system, to open the bowels, and promote the secretion of urine.

The dose of this medicine, should not exceed from 20 to 30 drops. It may be conveniently taken when mixed with a thin syrup, or in the form of an emulsion, into which it may be reduced, by triturating it with a thick mucilage of gum arabic, till both ingredients are well incorporated, [illegible] then gradually adding a proper quantity of water

Balsam Copaiba ought never to be given in coughs where inflammatory symptoms are present · but in the catarrhal affections to which old persons are liable, it is an useful medicine. A convenient way to take it, is to wrap it up in brown sugar, drinking a glass of water after each dose. In the *fluor albus*, or whites of women, it is an useful medicine; in the piles it has occasionally been serviceable. [I doubt this last observation.—T C.]

COPAL, improperly called *Gum copal*, is a resinous substance obtained from the concrete juice of the *Rhus copallinum*, or narrow-leaved sumach, a native plant of North America, known there by the name of *Beach-sumach*. This resin is imported in irregular masses, some of which are transparent, of a yellowish or brown colour, others are whitish and semi-transparent. It possesses a more agreeable odour than frankincense, but is, unlike other gums and resins, neither soluble in water nor in spirit of wine. By these properties it resembles amber; which has induced some to consider it a mineral bitumen similar to that substance. It yields, on distillation, an oil, which, like mineral petrolea, is indissoluble in spirit of wine.

As the directions necessary to be attended to in the manufactory of copal varnish, apply equally to varnishes of all kinds, the whole will be treated of under the latter article.

COPPER, one of the finest imperfect metals, is found in the bowels of the earth, in the following states.

1. Native or pure copper, which possesses the red colour, the malleability, and all the other properties of this metal.

[Native copper is found in a mine in Maryland, formerly owned by Messrs. J. NICHOLSON and JOHN MUSSER, of Lancaster, in Pennsylvania. A mass of native copper, first noticed by Captain CARVER, is found in a river that empties into Lake Superior from the south. This mass is, on the average, about 18 feet in circumference. Common copper is of the specific gravity about 8·4, but the copper of Japan is somewhat heavier.

To try copper ore: drop on the ore a drop of acid of nitre; let it remain a minute; then press on the part thus moistened, a polished blade of a knife, or a key, and the metallic copper, (if the ore be a copper ore) will be precipitated on the iron. When copper is refined the workmen direct the nose of the bellows on the melted mass, at an angle of 45 degrees. The ancient mirrors were made of four parts copper and one tin. The ancient weapons of 100 parts of copper and 14 parts of tin, very hard compounded have been made of copper, [illegible] and to steel, and very useful [illegible] [illegible] per, tin and crude platina [illegible] all in-

II. Mineralised by oxygen [illegible] to these there are several varieties; 1. [illegible] neper, or hepatic [illegible] of [illegible], is known by its dusky colour, which [illegible], generally mixed with native [illegible] which [illegible] mountain green. 2 *Earthy* or [illegible] mountain green, which is [illegible] in a loose friable state, and frequently blended with calcareous earth, iron, and sometimes with arsenic.

III. Mineralised by sulphur

IV. Mineralised by sulphur with a proportion of iron.

When taken into the human body, copper acts as a violent emetic, and is generally considered as poisonous [The best remedy for this poison is liver of sulphur, taken in pills or in some dilute liquid.—T. C.] And though it has occasionally been prescribed by physicians, it is always an unsafe and hazardous remedy. Hence, the greatest precaution is necessary in using this metal, of which so many kitchen utensils are manufactured. Besides the most scrupulous attention to cleanliness, it is extremely improper to leave any liquid to cool in a copper vessel; for this metal is more easily decomposed by liquids. when cold, than in a heated state.

In order to prevent the deleterious effects of copper, the vessels made of it are usually covered with tin, on the inside. It is nevertheless justly complained, that the tinning of copper vessels is not sufficient to defend them from the action of the air, moisture

and saline substances; because, even when strongly coated, they are liable to rust. [Hence they are gradually going out of use. Various substitutes for tin have been proposed, but I believe none have been found worth adopting in practice.—T. C.]

Copper is a red or orange-coloured metal, about nine times heavier than water. It is the most sonorous of all metals, and except iron, the most elastic.

In a state of nature it is found under a great variety of forms, sometimes in masses of pure metal, but more frequently in combination with other substances. There are valuable copper mines in Great Britain, particularly in the island of Anglesea, and in Cornwall. This metal is likewise found in China, Japan, Africa, and in various parts of the continent of Europe.

Copper ore has to go through several [illegible]sses before the metal is rendered [illegible] next [illegible] the Paris mine, in Anglesea, [illegible] of the earth it is broken into small pieces. It is [illegible] length, and [illegible], where it is set on [illegible] parts, to undergo the [illegible] sting. The sulphur con[illegible] ore is expelled in fumes, by the heat. After the ore has been thus roasted, an operation which occupies from three to ten months, according to the quantity in the furnaces, it is taken to places denominated slaking-pits to be washed. It is then conveyed to the smelting houses, where, by intense heat, the pure metal is drawn off in a fluid state.

[Note [illegible] 28 pieces [illegible] 14 [illegible]

As the water which passes through several parts of the Paris mine is strongly impregnated with copper, the proprietors turn its course through certain large and shallow pits which they have formed for the purpose, and in each of which they place a quantity of iron. This after a while is corroded, and at length entirely dissolves, whilst a brown powder, which is richly impregnated with copper, falls to the bottom. One ton weight of iron thus immersed will produce nearly two tons of copper mud, each of which when melted will yield sixteen hundred weight of metal. This mode of obtaining copper is said to have been an accidental discovery from one of the workmen, several years ago, having left a shovel in the water, which when afterwards taken out appeared changed into copper.

The magnitude of the above mentioned copper works may readily be conceived when it is stated that the beds of ore are in some places more than sixty feet in depth; that the proprietors employ more than 1000 workmen, and ship, from the adjacent port of Amlwich, upwards of 20,000 tons of copper annually.

There is at Ecton, in Staffordshire, a copper mine which is now worked at the depth of 1,416 feet below the surface. This is the deepest mine in England.

The uses of copper are numerous and important. When rolled into sheets [illegible] ixt large iron cylinders, it is employed for the covering of houses, sheathing the bottoms of ships, and for other purposes As a covering for houses copper is lighter than slate, but whether it be more durable has not yet been ascertained. Plates, or flat pieces of copper are used by artists for engraving pictures upon, either by cutting them with a sharp steel instrument, or corroding them with aqua fortis, in lines drawn by a needle through a thin coat of wax spread upon their surface.

Copper is manufactured into various kinds of cooking utensils Great care, however, ought to be taken that acid liquors, or even water intended for drinking, or to be mixed with food, be not suffered to stand long in such vessels, otherwise they will dissolve so much of the metal as to give them disagreeable and even poisonous qualities. Yet, it is remarkable that while acid liquors are kept boiling they do not seem to dissolve any of the metal. Hence it is that confectioners by skilful management, prepare the most acid syrups in copper vessels, without their receiving any unpleasant taste or injurious quality from the metal. All vessels formed of this metal which are employed in cookery ought to have their inner surface covered with a thin coat of tin.

As copper does not, like iron, strike fire by collision, it has on this, as well as on some other accounts, been substituted for iron in the machinery which is employed in gunpowder mills. It is also made into water-pipes, and sometimes into sash-frames. Under the hammer it is capable of being extended and beaten into thin leaves like gold. Copper wire is much employed by bell hangers and other artisans. The filings of this metal are used for giving a green colour to some kinds of artificial fireworks.

Several preparations of copper are

employed in medicine, some internally and others externally; but most of the former are violently emetic.

Verdigris is a rust or oxide of copper usually prepared from that metal by corroding it with vinegar. There is a large manufactory of verdigris at Montpelier, in France. The workmen place alternate strata of copper plates and husks of grapes during the vinous fermentation, when the grapes speedily become acid and corrode the metal. The verdigris, thus formed, is scraped off as it collects on the surface; it is afterwards dried and pu[illegible]gs or casks for sale. A solution of this substance in distilled vinegar affords permanent crystals, which are improperly called *distilled verdigris*, and are made into a green pigment. Verdigris is principally consumed by dyers in combination with logwood, for striking a black colour. It is a virulent poison.

Oxide of copper is employed for giving a beautiful green colour to porcelain. It also imparts the same colour to glass, and hence is frequently employed for the formation of artificial emeralds.

ALLOYS OF COPPER.

Brass is an alloy of copper with about a fourth part of zinc. It is a very beautiful, useful, and well known yellow metal. Not being so apt to tarnish and rust as copper, and being, in other respects, better adapted for the purpose than that metal, it is much used for clock-work, and for mathematical and astronomical instruments. It is more ductile than either copper or iron, and hence is peculiarly fitted to be made into wire, for the strings of musical instruments and other purposes. Sieves are woven with brass wire, after the manner of cambric weaving, of such extreme fineness that they could not possibly be made with copper wire. Brass wire flatted and gilded is sometimes made into lace. The finest brass is manufactured at Geneva. It unites great beauty of colour to a high degree of ductility, and is used chiefly for escapement wheels, and other nicer parts of watch making. For work in which there is no friction it is necessary to cover brass with a kind of varnish or *laquer*, to improve its colour, and prevent it from being tarnished by exposure to the atmosphere.

Prince's metal or *pinchbeck* is an alloy containing three parts of zinc and four of copper. This metal has nearly the same colour as gold, and was formerly much in use for the manufacture of ornamental articles of different kinds.

Dutch gold is formed by cementation of copper plates with calamine hammered out into leaves. This article is chiefly manufactured in Holland and Germany, and has about five times the thickness of gold-leaf.

Bronze, and *the metal of which cannon are made*, consist of from six to twelve parts of tin combined with 100 parts of copper. This alloy is brittle, heavier than copper, and of a yellow colour. It was used by the ancients for the manufacture of sharp pointed instruments, before the method of working iron was brought to perfection; and is supposed to have been the *æs* or brass of the Romans.

Bell metal, or the metal of which bells are formed, is usually composed of three parts of copper and one of tin. Its colour is greyish-white; and it is very hard, sonorous, and ela[illegible].

Bronze and bell metal [illegible], however, always made of copper and tin only. They [illegible]y have [illegible] mixtures, consisting [illegible] whic[illegible] arsenic.

Tutenag is a well know[illegible]hich h[illegible] used for making candlestic[illegible] cooki[illegible] articles. It is supposed to be [illegible]hite alloy of copper, zinc, and iron; and when well manufactured is of good colour, and not more disposed to tarnish than silver.

Blue Vitriol, or *Sulphate of Copper*, is a blue salt formed by the combination of copper with sulphuric acid.

This substance, though sometimes found in a state of concretion or in the form of powder disseminated over the surface of stones that have been in contact with water impregnated with it, is more frequently an artificial preparation obtained from evaporating the water which runs through copper mines.

Blue vitriol is used by artists and manufacturers in various ways. It is employed in dyeing; and enters into the composition of black colours, to which it gives depth and solidity Blue feathers are stained by plunging them into a hot solution of it. The beautiful grass green colour of the shops, called *mineral green*, is made from blue vitriol; and fowling pieces, and tea-urns are browned by washing them with a preparation of it.

Malachite is a solid green copper ore, the surface of which has frequently a bubbled appearance, and the interior is marked with numerous irregular zones

and layers of different shades of green. It is somewhat more than three times as heavy as water, and is sufficiently soft to admit of being scratched by a knife.

The Vosges mountains in Lorraine, and certain copper mines of Saxony are celebrated for producing very fine specimens of malachite. It is also found in England, in the counties of Cornwall and Somerset.

In its appearance it somewhat resembles green jasper, but is by no means so hard. Still, however, it is capable of being cut and polished as a gem, and is manufactured into various kinds of trinkets, which of late years have been much in request for ladies' dress. It is also cut into slabs, and mounted into snuff boxes. Such is the size of which it is sometimes found, that M. Patrin saw at Petersburgh a plate of malachite thirty-two inches long and seventeen inches broad, which was valued at [illegible]0,000 livres; but the finest specimens in Europe are considered to be some slabs adapted as the tops of [illegible], sideboards, &c. at Trianon in [illegible] the largest of [illegible] feet in length [illegible] wide. These may have [illegible]

[Note [illegible] 28 pieces by various pieces joined together 14, but if so the joints are so completely concealed as not to be discoverable even by the closest examination. Malachite is sometimes employed for the engraving of cameos, but is seldom cut in entaglio. Smaller pieces of this substance that are used for trinkets are about the same value as cornelian. Independently of its use in the above respects, and also as an ore of copper, this substance, when pure, is ground into powder and employed as a green pigment.

There are some fine specimens of malachite in the British Museum.

[Malachite or mountain green is found very fine near Morgantown, in Pennsylvania.—T. C.]

COPPERAS, a name given to blue and to green vitriol.

[The first is the sulphuric acid combined with copper: the second is the same acid combined with iron. Blue vitriol is made by evaporating the water in which copper ore is washed after being calcined to drive off the sulphur which mineralises the copper. The oxygen of the air combines with the sulphur and acidifies it, which then combines with the oxyd of copper and dissolves it. Blue copperas, or blue vitriol, is thus made at the copper works of Anglesea. This salt is used,

1st. As an emetic in desperate cases of poison or croup.

2. To dye blue with logwood.

3. To make verditer when precipitated by chalk or alkali.

4. To make the green pigment called Scheele's green, when precipitated with arseniat of potash.

5. The verditer precipitated by alkaline carbonats is used by hatters for the same purposes and in the same proportions as verdigris.

6. It is used as an escharotic.

7. When precipitated by prussiat of potash it affords a lively brown pigment.*

8. It is used by apothecaries for a blue transparent liquid for their shop windows. See also the preceding article.

Green Copperas, or *Sulphate of Iron*, is usually procured by exposing to the moist air the shist, slate or shell containing pyrites that generally covers the roof of coal mines. The air acidifies the sulphur, which then combines with the iron. The rains wash it into drains leading to reservoirs, where it is left to settle, and is then crystallised by boiling. It is used,

1. For dyeing black, on all kinds of substances.

2. For making ink.

3. When calcined it is used for razor strops, as colcothon or crocus martis, and for polishing.

4. In medicine as a tonic in the dose of 2 or 3 grains. It is the sal martis of the shops.—T. C.]

CORAL, *Corallina*, L. a genus of insects, consisting of eight species, which are found in the ocean.

There are, properly, but three kinds of coral, namely, red, white, and black; the last of these is the rarest and most esteemed. When coral is first taken out of the sea, the small protuberances on its surface are soft, and yield on expression a milky juice, which effervesces with acids. The cortical part, or the external coat, is not so compact as the internal, and may easily be separated, while in a fresh state. The greatest traffic in this article is carried on at Genoa and Leghorn.

Coral is not unfrequently imitated, by artificial compositions, so as to resemble the real. But this fraud may be detected by exposing it to fire; as the counterfeit does not afford the alkaline earth, yielded by the genuine coral. The colouring ingredients em-

ployed in preparing the former, are cinnabar and minium, both of which are easily ascertained. The natural coral seems to receive its colour from iron, as spirit of vitriol acquires from it a ferruginous taste; and on calcination, some particles are discoverable among the ashes, that are attracted by the magnet.

Various unsuccessful attempts have been made to extract a fine colour from red coral, the (gorgonia or) *Isis nobilis*, L. by means of spirit of wine. A successful method is said to be as follows: Dissolve a pound of sugar [illegible] little water, add to it half a pound of wax, then take a pound of coral, and boil them together. Thus the coral will part with its redness, and remain in other respects unaltered. In order to prepare this tincture, the wax and sugar must be previously dissolved in spirit of wine.

[Many islands in the eastern and southern oceans are formed by the insects that construct and inhabit the coral beds. Hence it has been proposed to guard the banks exposed to the ocean, by making a plantation of coral. —T. C.]

It is by no means agreed whether coral be animal or vegetable. The species are distinguished by the form of their branches; and they are found adhering to shells, rocks, &c. Mr. MACDONALD, in a paper on the coral of Sumatra, in the fourth volume of the *Asiatic Researches*, after referring that species of plant, as he denominates it, to the class of *Cryptogamia* of LINNÆUS, observes, that it differs from the descriptions of coral hitherto given, and therefore, obliges us with the following account of it: "It is of three colours, red, black, and whitish yellow; the last is the most common in the eastern seas. It is of a fungous texture, equally hard in and out of its natural element; and its pores are charged with a juice of a milky appearance, in some degree acrid. The bark covers every part of the tree, and contains a number of perforated papillæ, or pores, terminating in tubes. The internal projections of the papillæ adhere to the particles of sand and stone, on which the coral grows, and are the only appearance of roots it exhibits" The tree, in general, he observes, grows to the height of two feet, but in some instances to that of ten. From its rapid growth on the western coast of Sumatra, he thinks that the coral ought undoubtedly to rank as a vegetable; yet modern naturalists seem to have determined differently concerning this production of the ocean; some affirming it to be a fossil, formed like crystals and spars, while others rank it among the animal tribes. Sir WILLIAM JONES, in an additional note, defines corals and

CORALLINES, according to the approved system of Ellis, as the cretaceous habitations of animals, and one of the links in the great chain of nature. Mr MACDONALD's notion, that an artificial island, for the purpose of safe anchorage, might in time be produced from a quantity of corals, mixed with stones and other substances, transported to the coast of Coromandel, and sunk at the mouth of the dangerous part of Madras, is a very ingenious one, were it practicable; but Sir William remarks, that it would, in all probability, occasion from its quick increase, a dangerous reef of rocks, before that island could be formed.

CORD, a combination of several threads of hemp, twisted [illegible] by means of a wheel.

Cords are [illegible]ly useful for various purposes o[illegible] more particularly in the [illegible] of ships; in which case they [illegible], according to their size, called cables or ROPES, to which we refer. Hence, the manufacture of these articles has become an object of considerable importance.

In the common way of making cordage, it has been found that by being twisted too tight, ropes were rendered incapable of raising weights beyond a certain proportion, and that, from the friction occasioned by their inelasticity, they were neither very durable, nor always safe. Various means have been devised to obviate this defect, and several patents have lately been granted, from which we select the following.

In July, 1792, Mr. JAMES MITCHELL, of Poplar, and Blackwall, Middlesex, obtained a patent for a method of manufacturing cordage on a scientific principle. It apparently consists in subdividing the twists or cylindrical parts of ropes or cordage, and giving them a peculiar turn, so as to make them blend and unite; and also to operate in such a manner that the component parts act in spiral directions, similar to parallels. By this mode the yarns all bear together, so that the cordage acquires an increased degree of tension, as well as a greater power of resisting fluids and friction, and also a more uniform elasticity.

A patent was also granted, in Janu

ary, 1798, to Mr. W. CHAPMAN, of Newcastle-upon-Tyne, for a new method of manufacturing ropes or cordage. The patentee describes his invention to consist in placing those parts that separately twist the rope and *strands* (each of which contains a number of yarns twisted together) at a certain determinate distance. By such means the process of twisting is not completed through the whole length at once, but only in the intermediate space. With this circumstance, the patentee combines a mode of twisting the cord or rope itself, by an arbor or shaft, perforated either through the whole or a part of its extent, and revolving round its own axis; and which, at the same time, twists its several parts, by means of separate arbors or shafts, either perforated or otherwise, each of which performs a like revolution. Thus not only the operation of twisting the cord or rope is effected, but also that of coiling it up, by the motion of the machine, while both time and length of ground are saved, which, according to the prevailing mode of making cordage, are [illegible].

Another patent which we shall notice, is that granted in August 1799, to JOSEPH HUDDART, of Islington, Esq. for an improved method of forming the strands in the machinery for manufacturing cordage. The leading principle of this invention is, to give the length of the yarns composing the strand, a certain ratio, in proportion to the hardness, or compression, with which the rope is intended to be *laid*, and thus to acquire a more equal distribution of the strain upon the yarns, than upon ropes made in the common way. This is effected, 1. By keeping the yarns separate from each other, and drawing them from revolving bobbins, in order to keep up the twist, while the strand is forming; 2. By passing the yarns through a register, which divides them by circular holes (Mr. HUDDART says, circular shells of holes) the number in each being agreeable to the distance from the centre of the strand, and to the angle which the yarns make with a line parallel to it, that gives them a proper position to enter; 3. By a cylindrical tube which compresses the strand, and maintains a cylindrical figure to its surface. 4. By a gauge, to determine the angle which the yarns in the outside shell makes with a line parallel to the centre of the strand, when registering; and, according to the angle made by the yarns in this shell, the length of all the yarns in the strand will be determined; lastly, 5. By hardening up the strand, and thus increasing the angle in the outside shell, which compensates for the stretching of the yarns, and compression of the strand. By attending to these directions, every yarn in the strand will bear a strain, when at the point of breaking; and, when laid into a rope, it will acquire additional strength.

In June, 1801, a patent was granted to Mr. WILLIAM CHAPMAN for the application of certain snbstances designed to preserve cordage; and which, being either with difficulty soluble, or totally insoluble in water, tend to render such ropes more durable, than has hitherto been practicable. The usual method adopted for this purpose, consists in boiling tar alone, till it be inspissated to a proper consistence; but Mr. CHAPMAN proposes to boil the tar in two or three different waters, till it be divested of its acid, and all the mucilaginous particles; which, by the common process, remain in the liquid preparation; and, by their speedy tendency to decomposition, frequently contribute to the decay of the ropes, at an earlier period than would naturally take place without such practice. He therefore adds a due proportion of suet, tallow, or any fixed oil, that has been deprived of extraneous matters, by similar boiling.

Cords were originally made of leather, or the hides of animals: these gave way in this country to the use of iron chains. In more distant nations to the south, thongs and chains were superceded by the use of vegetable shreads, and the arts of combining them into strength. The junci or rushes, in later times were worked up into cordage, by our own ancestors, and hence, perhaps, old cables, and ropes, are now called "old junk"

CORDOVAN LEATHER, is made from the skin of the horse.

CORDWAINER, the term whereby the statutes denominate a shoemaker. The word is from the French *cordouannier*, which Menage derives from *cordouan*, a kind of leather brought from Cordova, Cordona, or Cordua, a city of Andalusia.

CORIANDER, the COMMON, or *Coriandrum sativum*, L. is an annual plant, growing in corn-fields, on road-sides, and dunghills. This vegetable is raised from seed, generally sown in the month of March, in the proportion of 14 lbs. to an acre. It is also cultivated toge-

ther with caraway and teazel; but as neither of those plants comes up completely and regularly the second year, they are usually allowed to stand for the third summer If sown with caraway, the coriander requires great care in hoeing, to distinguish it from the former, which is not set out for a crop, till the latter is harvested. When reared alone, the plants of coriander are set out from four to six inches apart, and produces whitish flowers that blow in June or July, and contain two seeds. The leaves of this vegetable have a strong, disagreeable smell; the seeds possess a pleasant flavour, and when encrusted with sugar, are sold by the confectioners, under the name of *coriander comfits* They have been recommended as carminative and stomachic. Six drachms of them, however, have been taken at one dose, from which Dr. WITHERING did not observe any remarkable effect.

Coriander seeds are now used in the bitter infusions and preparations of senna, the disagreeable taste of which they completely overcome; and by the French in cookery.

CORIDOR, in architecture, a gallery leading to several chambers, sometimes wholly inclosed, and sometimes open on one side.

CORINTHIAN ORDER. See ARCHITECTURE.

CORK-TREE, or *Quercus suber*, L. a species of oak indigenous in Spain and Portugal, where it attains the height of from 30 to 40 feet; has a thick, rough, fungous bark, and oval serrated leaves, which are downy underneath. The bark of this tree furnishes that useful material, *cork;* which, becoming of a thick fungous nature, is separated from the trunk, while a new bark is formed under it, which, in the course of six or seven years, is sufficiently thick for *barking*. Nevertheless, the tree continues to vegetate, and another fresh bark grows under the former, which likewise affords cork in the same period of time.

The bark is taken from the tree by making an incision down the whole height of the trunk, and, at each extremity, another round the girth. The tree is supplied with this coat in a degree so peculiarly abundant, that not only it continues to flourish uninjured by the act of barking, but, in its natural state, regularly sheds the whole, and acquires a new covering. The pieces of bark are flattened artificially, by placing them in water, and under heavy stones.

In the *Gentleman's Magazine* for 1758, we meet with the following curious contrivance of a *cork waistcoat*, for the purpose of preventing accidents by drowning. It was invented by Mr. DUBOURG, and is composed of four pieces of cork, two for the breasts, and two for the back, each being nearly of the same length and breadth as the quarters of a common waistcoat, without flaps; the whole is covered with coarse canvas, having two holes to put the arms through. There are spaces left between the two back pieces and each back and breast piece, that they may the more easily be adjusted to the body. Thus, the waistcoat is open only in the front, and may be fastened on the wearer with strings; or, if it should be thought more secure, with buckles and leather straps.

The weight of this cork-waistcoat does not exceed twelve ounces, and may be made at a very moderate expense. It is more simple in its form than any other contrivance for a similar purpose. Mr. [illegible]OURG [illegible] a trial of its efficecy in the Thames, and found that it not only supported him on the water, but that even two men, with their utmost efforts, were not able to sink him. Hence it is eminently calculated for mariners, passengers at sea in general, and likewise for all those who resort to bathing places for the benefit of their health; as the most timorous and delicate person may, with perfect safety, boldly venture with one of these waistcoats into a rough sea. See BAMBOO-HABIT.

The expense of providing a sufficient number of them for the British navy, can be no objection to a nation so gratefully fond of a powerful marine establishment. Those of our readers who are desirous of obtaining farther information on the subject of *cork-waistcoats*, we refer to a treatise written by Mr. J. WILKINSON, and entitled *The Seaman's Preservation, or Safety in Shipwreck.*

[If the old corks of bottles are saved, and strung together, and then sewed up in linen, five hundred will make a good cork jacket. Round balls of cork are substituted for leaden weights to sashes: cork is also a principal material in Mr. GREATHEAD's life-boat.— T. C.]

Cork is applied to various uses, by different nations The Egyptians made coffins of it, which being lined with a

resinous composition, preserved dead bodies from corruption. The Spaniards burn it, to make that kind of light colour we call *Spanish black*, used by painters. They also employ it to line stone walls; an expedient which not only renders them much warmer, but also corrects their moisture in damp weather.

Cork is principally employed for stopping bottles and casks, and lining the inner soles of shoes and slippers.

Other vegetables have been found, which may be employed instead of cork, for stopping bottles, jugs, &c. Among these is the wood of a tree common in South America, in moist places, called *Monbin*, (*spondies lutea.*) This wood is brought to England in great abundance for that use. The spongy root of the Tupelo tree (*Nyssa*) a native of the United States, is also used for the same purpose, as are the roots of liquorice, which on that account is much cultivated in Sclavonia, and exported.

An attempt was made, by the commander of one [illegible] our national frigates, [illegible] the cork tree into the United States, but it failed, owing to bad weather on the coast. The attempt ought to be repeated; our consuls in Spain, Portugal and the Mediterranean should permit no vessel to leave the ports where they reside, without putting a young tree on board. In the states of N. and S Carolina and Georgia, cork-trees would undoubtedly thrive.

CORN, in rural economy, the grains or seeds of plants, which are separated from the ear, and used chiefly for making bread. [With us, this word usually means maize, or Indian corn. —T. C.]

There are several species of corn, such as wheat, rye, barley, oats, millet, and rice, maize, or Indian corn, &c. each of which will be mentioned in its alphabetical order [One general rule it will be proper to mention, viz. that the very finest grain of the species should be carefully selected to breed from, exactly for the same reason that we select the finest animals for a similar purpose.—T C]

In order to ascertain the relative value of different species of grain, corn-dealers avail themselves chiefly of the combined criterion of weight and measure. In a commercial point of view, such a method is doubtless the most accurate; but as it cannot be explained without entering into a very diffuse detail, accompanied with numerical tables, we shall communicate to our economical readers only a few practical directions, by an attention to which, they may be sufficiently guided in the sale or purchase of corn in general:

1. Take a handful of grain from a heap, or sack, and compress it closely for a minute; then pass it from one hand into the other, and attentively examine its flavour, whether it possess any peculiar smell, different from that which is natural to the species: in which case you may conclude that it has been repeatedly exposed to moisture, and undergone a slight degree of fermentation. The flour obtained from such corn, is deficient in measure, of an indifferent quality, and affords neither nourishing, nor wholesome bread.

2. If, on pressure by the hand, the grains appear so solid and smooth that they in a manner glide through the fingers, without having any foreign smell or colour, in this case it may be pronounced perfectly dry, and in a good state of preservation.

3. Should, on the contrary, the corn feel rough, or, if a number of grains, after compressing them by the dry hand, clog together and adhere to the fingers, it may be justly apprehended that such wheat, rye, &c. is *damp*, and possessed of all the bad properties before specified.

As the nature of the present work does not permit us to enter into a minute analytical account of the specific gravity of different kinds of corn, and their relative proportion to each other (which properly belongs to the mercantile speculator), we shall supply this apparent deficiency, by the following comparative view.

Every attentive observer will find, that frequently, some species of grain bears a price in the market, far exceeding its relative value, or proportion to other kinds of grain, which, in many instances, may serve as excellent substitutes. From the prices which have prevailed in different countries, during a long series of years, we have derived the following result of numbers:

Wheat, ...	41
Rye, ...	32
Barley, ...	23
Oats, ...	14.

TABLE OF PROPORTIONS.

	Wheat.		*Rye.*		*Barley.*		*Oats.*	
Wheat,	1	1	5	4	7	4	3	1
Rye,	4	5	1	1	3	2	16	7
Barley,	4	7	2	3	1	1	8	5
Oats,	1	3	7	16	5	8	1	1

It deserves, however, to be remarked, that these proportions occasionally vary, accordingly as the soil of different countries is more favourable to the production of one species of grain than to the other; and likewise as there is a greater or less demand for particular kinds of corn in the market, especially in barren or unproductive seasons. Thus, in Britain, the price of barley and oats is almost constantly disproportionate to that of wheat, and especially to *rye*, which may, consequently, be considered as the *cheapest* bread-corn. The immense quantities of malt-liquors brewed in that country, and the great number of horses kept for pleasure, are sufficient reasons why barley and oats are sold at prices comparatively higher than their intrinsic value, in relation to wheat and rye. But if the rates stated in the preceding table be adopted in the computation of prices, and the farmer, or corn dealer, be desirous to know what proportion, for instance, the price of oats bears to that of rye, let him search in the horizontal line for oats, and in front of the perpendicular line for rye: the field, or partition where both meet, contains the numbers 7 : 16, viz. that the price of oats is in proportion to that of rye, as seven to sixteen; and so forth, with respect to the other species of corn here exhibited.

CORN, Indian. *Zea Maiz.* In the United States, two kinds of Indian corn, or mayz, are commonly cultivated. The gourd seed-corn, (so called from its resemblance to the gourd seed) and the yellow corn; the seed of which is plump and round. The former kind is generally raised in the states of North and South Carolina, and Georgia; and the latter, in the more northern states. In some of the states, a white plump grain is also raised for the common and excellent dish *homany*. The late Mr. Bartram informed Dr Mease, that he saw in the Creek nation of Indians, a small corn in general use, which consisted almost entirely of flour, and was easily pulverised: he thinks the most pleasant corn cakes he ever ate, were made of this kind of corn. The agent of the general government with the Creeks would render service to the state, by circulating this corn in different parts of the union.

Corn in England is the general term, for all kinds of grain, but in the United States, by *corn*, is always meant, *Indian Corn*, (*Zea Maiz*,) and to this, it is proposed to confine the present additional observations.

In the United States, the greater part of a field of corn, in some seasons, is destroyed by birds, and ground squirrels. To prevent this loss, Mr. James Graham, of New York, says, (*Trans. Agri So N York*) he finds no plan so successful, as that of *tarring the seed*, in the following manner. Put as much corn as you expect to plant the next day, into warm water in the evening: the ensuing morning drain off the water; then pour on as much hot water as will cover it, and immediately after, throw in tar, at the rate of about one pint to a bushel, stir the tar through the corn, until the grains appear to be uniformly coated with the tar, then put it into a basket to drain: after the water has ran off, throw it into a large tub or trough, and stir among it as much ashes, lime, (slacked) or gypsum, (plaister of Paris) as will adhere to the grains; by which means they will easily separate from each other, and may be as conveniently planted, as if they had never been tarred. Mr. G. prefers gypsum, to either lime or ashes, as it will not be [illegible] to injure the fingers in planting, [illegible] also, in equally small quantities, more powerfully promote vegetation.

The precaution of soaking the corn before applying the tar, is highly necessary, as the coat of tar and gypsum would otherwise, (especially in dry seasons) prevent it from absorbing moisture sufficient to produce vegetation.

It is important too, in all cases where corn has been soaked, to plant it immediately after the plough, when running the cross furrows.

Mr. G. has experienced the good effects of thus preparing seed-corn, principally in preventing the ravages of crows and black birds, the most common enemies of our spring crops, but has no doubt that it will be found equally beneficial in preserving them from others, such as ground squirrels, &c.

Birds are, however, not the only enemies to corn which the farmer has to contend with. M Peters observes, that the *cut-worm*, or *grubs*, destroy many of the young shoots above ground. A decoction of hellebore, mixed with sulphur, soot, and a little nitre (saltpetre) is equally offensive to vermin; and if the seed, after being soaked in this mixture, is encrusted with plaister, it *remarkably* forwards the growth.

Replanting of corn, according to Mr Peters, seldom answers well. Transplanting of plants raised in the garden,

or in any clear and rich corner of the field, is much more eligible. This is easily managed, by sowing in drills, a small quantity of corn, at the time of planting the field. If the plants are not wanted, the loss or trouble is inconsiderable. Plants may also be had from hills in which too many seeds have been dropped. It is too common to have more plants in a *hill*, than are profitable. Three at most are sufficient. Although the places where the corn is dropped, are called *hills*, the old practice of hilling is for the most part, abandoned. The necessary use of the hoe is not omitted, but the plough is chiefly used to earth and tend the corn. Great attention should be paid to destroy the suckers, which draw off the supplies both from plants and ears.

After several experiments, in order to find the most advantageous method of planting corn, Mr. Spurrier, of Delaware, found the following exceeded all others.

He prepared his land, by ploughing it in the autumn, in single boughts; in the spring he harrowed it down as smooth as possible; and ploughed it; then harrowed it again, and marked out the furrows at *eight* feet distance: in these furrows he dropped the seed single, at about the distance of every foot; his cart loaded with manure from the compost heap, followed in the alley between, and covered the seed in the furrows, about three or four inches thick, with the manure. This was done almost as expeditiously as in the common way, covering it with mould by the hoe.

By this method, the plants came soon up, and flourished very vigorously. When the plants were about six inches high, he ploughed between, taking the mould from the plants, throwing it up in a ridge in the middle of the alley, and with a hand hoe, cut up the weeds and superfluous plants. If they are left at two feet distance in the rows, they will be thick enough.

The next ploughing, he took the mould from the middle, throwing it up to the plants. Every time of ploughing, he used the hand hoe to stir the ground between the plants, and to destroy the weeds The third ploughing, he did as the first, throwing up the mould in the middle of the alley. This is of more use than a person would imagine, for it admits the influences of the air and dews to penetrate to the roots.

The fourth ploughing, which was the last, he managed as the second, by throwing up the mould to the stalks of corn. If this last ploughing could be so contrived, as to be done *early in the morning*, before the sun has exhaled the dew, it would bring those riches in the ground, which would afford a double nourishment. The land, upon which Mr. Spurrier tried this experiment, was between a loam and a clay.

Sands and light lands will not require so many ploughings.

A gentleman of Philadelphia county had his seed-corn soaked in the black water of a dung heap, and in which some salt-petre was dissolved: when planting, he added a small handful of gypsum to each hill, when up he put on a little more, and *when the ears were about to set*, a small quantity was again added. His crop was very abundant, as we witnessed; and was the more remarkable, as the field had been worn out by bad management In rich ground, however, the application of all these strong stimulants to the grain may prove injurious, by causing too great a growth of the stalk. The second application of the gypsum may in such cases be omitted.

Indian corn is commonly planted in the beginning of May, in Pennsylvania, but if the ground be rich, and gypsum used as a manure, and the season should prove favourable, the stalk will grow so tall by harvest, and the roots so numerous, that it will be difficult to plough among them. Added to this, the farmer will not have time to attend to the corn, and as the season at harvest is commonly dry, it may suffer by neglect: a judicious farmer, therefore, of Philadelphia county, plants his corn the end of May, and thus is enabled to give it the last ploughing after harvest. He also soaks and rolls his corn in *slacked* lime, to prevent the birds picking the grains; and finds the practice successful. Mr. Peters approves highly of this practice of ploughing after harvest, if *it be done when the weather is moist*. In a drought, it is rather dangerous. He adds, "It requires a good tilth to keep down weeds. Nothing requires more clean farming, than corn, which is seldom ploughed often enough."

A plain farmer informed the editor, that he made the following experiments on the comparative effects of different manures for corn.

He manured different parts of the same field of corn, with dung of cows, horses, and hogs; and the ashes of

blackberry bushes and other briers cut down from the fence side: the ground manured with the ashes produced an earlier and better crop, than any other part of the ground. The hog-dung produced the next best crop. He put two shovels full of the ashes to each hill of corn. These facts, which are the result of a laudable wish in a plain farmer to ascertain an important point, deserve attention.

The following account of two crops of corn, deserves to be universally known, as an incitement to the spirit of emulation and industry among farmers.

"Mr. John Stevens, of Hobocken, New-Jersey, and Mr. D Ludlow, Westchester, betted fifty guineas upon the superiority of their crops of corn. Mr. S. ploughed his ground three times before planting, and before the last ploughing, put on 700 horse cart loads of street manure; he planted in double rows at 5½ feet asunder, and dibbled each grain. To do this with expedition and accuracy, he bored two rows of holes in a piece of board four feet long, so as to form equilateral triangles, the sides of which were seven inches, thus:

Into these holes he drove pegs, about 3½ inches long. As the corn was dropped into these holes, made with this machine, a man followed, with a basket of rotten dung with which he filled them up. Then came on the carts, out of which the rows were sprinkled with a coat of *street manure*. During the season the crop was suckered three times. The intervals were repeatedly ploughed, and the rows kept perfectly clean of weeds by hoeing and hand weeding. The produce of the crop was as follows:—233 2-thirds measures full of corn in the ear. A measure full contained one bushel and a half and one pint of shelled corn; 233 2-thirds give consequently 354 bushels and 6 quarts, or 118 bushels and 2 quarts per acre. Mr. S. is confident, that he would have had considerably more corn, had not his crop suffered very greatly by a thunder storm, which laid the greater part of it down at the time the ears were setting.

Mr Ludlow planted in continued rows, four feet asunder, and eight inches from stalk to stalk in the rows, and manured with 200 horse-cart loads of street dirt. His crop was as follows:

Total, 182 measures of corn in the ear. Shelled corn in full measure, one bushel and a half and four quarts, which in 182 gives 295 bushels and 12 quarts, or 98 bushels and 14 quarts per acre.

These are truly noble crops, and do honour to the industry and agricultural skill of the cultivators.

A friend says, in New-Jersey, it has been found, that corn planted after clover cut in May, and the stubble ploughed yields an abundant crop. There can be no reason why the same good effects ought not to follow a clover lay for corn, as for wheat, the experience of which is so familiar to us, in Pennsylvania.

Mr. Bordley directs to cut up the corn stalks close to the ground, near the end of September, with sharp hoes, having first stripped the blades and cut off the tops, but always leaving the ears on: and to pile the stalks and corn in a pyramidal form in small parcels, to cure. A friend found some years since, that by thus exposing his corn to the frost, it ripened better than if permitted to remain standing in the field, as is commonly practised.

Darwin also says, that the frosty nights of autumn in Scotland contribute to ripen the late crops of that cold climate: he supposes the frost converts the mucilage of the grain sooner into starch.

Mr. Bordley makes the following excellent remarks: "Observing much irregularity in the standing of mayz in the rows, I caused the seed, after listing and crossing, to be carefully placed *close* to the *landside* of the furrows: not dropt in the careless scattering manner usual. The corn thus grew straight, and admitted the ploughs to pass near the plants.

The following highly valuable observations are by Joseph Cooper esq of New Jersey, and doubtless will receive serious attention; they tend to prove what perfection may be attained by continued care and attention, while at the same time, they shew the absurdity of the common opinion of the necessity for changing seed.

"In or about the year 1772, a friend sent me a few grains of a small kind of Indian corn, the grains of which were not larger than goose shot, which he informed me, by a note in which they were enclosed, were originally from Guinea, and produced from eight to ten ears on a stalk. Those grains I planted, and found the production to an-

swer the description, but the ears small, and few of them ripe before frost. I saved some of the largest and earliest, and planted them between rows of larger and earlier kinds of corn, which produced a mixture to advantage; then I saved seed from stalks that produced the greatest number of the largest ears, and first ripe, which I planted the ensuing season, and was not a little gratified to find its production preferable, both in quantity and quality, to that of any corn I had ever planted. This kind of corn I have continued planting ever since, selecting that designed for seed in the manner I would wish others to try, viz. When the first ears are ripe enough for seed, gather a sufficient quantity for early corn, or replanting, and at the time you would wish your corn to be ripe generally, gather a sufficient quantity for planting the next year, having particular care to take it from stalks that are large at bottom, of a regular taper, not over tall, the ears set low and containing the greatest number of good sizeable ears of the best quality; let it dry speedily, and from the corn gathered as last described, plant your main crop, and if any hills should be missing, replant from that first gathered, which will cause the crop to ripen more regularly than is common; this is a great benefit. The above method I have practised many years, and am satisfied it has increased the quantity and improved the quality of my crops beyond the expectation of any person, who has not tried the experiments. The distance of planting corn, and number of grains in a hill, are matters many differ in; perhaps different soils may require a difference in both these respects; but in every kind of soil I have tried, I find planting the rows six feet asunder each way, as near at right angles as may be, and leaving not more than three stalks in a hill, produces the best crop. The common method of saving seed corn by taking the ears from the heap, or crib, is attended with two disadvantages: one is, the taking the largest ears which have generally grown but one on a stalk—this lessens the production; the other is, taking ears that have ripened at different times, which causes the production to do the same."

[In the choosing of seed, choose 1st. the best in kind 2 the ripest: 3. ears that have all ripened at the same time: 4. those that have ripened earliest, if you want an early crop. You should take as much pains to select your seed grain, as your seed cattle or horses.—T. C.]

If twenty loads of good manure can be afforded for an acre, it should be spread on the land and ploughed in: if no more than half of that quantity, it will be best to put it in holes. In the former case, it usually comes up better, suffers less by drought, and worms; and the land is left in better order after the crop. In the latter case, the plants are more assisted in their growth, in proportion to the quantity of manure. If the manure be new dung, burying it under the furrows is by far the better method.

The right time of seeding the ground may be from the first to the third week in May; or a little sooner or later according to the dryness of the soil, and the forwardness of the spring. The farmers have a rule in this case, said to be borrowed from the aboriginals, which is, to plant corn when the leaves of white oak begin to appear. But so much time is commonly taken up in planting this corn, it being tedious work to dung it in holes, that it will be necessary to begin in the driest part of the field a little earlier than this rule directs.

Shell the seed gently by hand, that it may not be torn or bruised at all, rejecting about an inch at each end of the ear. And, if any corns appear with black eyes, let them also be rejected, not because they will not grow at all, the contrary being true, but because the blackness indicates, either some defect in drying, or want of perfection in the grain. Put three, or at most four corns in what is called a hill, and let them not be very near together; for the more the roots crowd each other, the more they will prevent the growth of each other.

If planting a second time should become necessary, by means of the destruction of the first seed, or if planting be delayed on any account till the beginning of June, then it will be proper that the seed should have warm water poured on it. Let it not soak more than a quarter of an hour, and be cooled speedily, and planted before it dries. The corn will be forwarded in its growth by several days. The seed should be covered with about two inches of earth.

To prevent birds and vermin from pulling up the corn, steep some corn in a strong infusion of Indian poke, or refuse tobacco, and sprinkle it over the ground before the corn is up. White

threads stretched over a field of corn, will prevent crows from alighting upon it. But I doubt whether this will deter any other birds

A handful of ashes, or a table spoonful of gypsum on each hill, will stimulate the plants, and have a tendency to prevent their being annoyed by worms. Some lay it on just before the first, or second hoeing. It will have a better effect in preventing worms, if laid on before the corn is up. But it is commonly designed to answer chiefly as a top-dressing; and for this purpose it would answer better near the third hoeing; for then the plants want the greatest degree of nourishment, as they begin to grow very rapidly. Two dressings, to answer the two purposes, would not be amiss.

When the plants are three or four inches high, the plough must pass in the interval, making two furrows in each, turned from the rows; and then the weeds killed with the hand hoe, and a little earth drawn about the plants. This operation we call weeding.

In about half a month after, plough again, but across the former furrows, and turn the furrows towards the rows. Then with the hand-hoe earth the corn as much as it will bear. This is called moulding or half-hilling.

When the plants are about knee-high, and before they send out their panicles, or spindels, give them the third and last hoeing. The best way is to plough one furrow in an interval, both ways. The cultivator with two mould-boards would be better for this work than the common horse-plough, as it would throw the mould equally towards each row, and save labour in hand-hoeing. The ground would thus be cut into squares, and the hills almost completely formed. In finishing them, care should be taken that they be not made too high, or steep, that they may not divert the water, which falls in rains from the roots. When hills are too much raised, they also prevent the warm influence of the sun upon the lowermost roots, by too great a thickness of earth; in consequence of which, the plants are put to the exertion of sending out a new set of roots, at a suitable distance from the surface. Some think high hills are needful to make the corn stand upright. I never could perceive the advantage of it. But I am confident it is oftener broken by winds when the hills are uncommonly high, which is a greater evil than its leaning half way to the ground, if indeed that be any evil at all.

The farmer who wishes for a large crop of this corn, should not annoy it with running beans, or pumpkins; the former, by winding round the stalks and ears, cramp them in their growth, and sometimes bend them down to the ground; by their weight; the latter, by their luxuriant growth, rob the hills of much vegetable food, and by their thick shade, shut out the influence of the sun from the roots of the corn.

At the second and third hoeings, all the suckers should be buried under the soil; not broken off, as is the common practice, because this wounds the plants. If the suckers be suffered to grow, they seldom or never produce fair and perfect ears; and they rob the ears on the main stalk of their nourishment. I mention the second and third hoeings, because the suckers will not all appear till the third; and the sooner they are destroyed the better the crop will be.

Instead of the common method of planting, if your land be rich, easy to till, and free from obstacles, I should think it would be best to plant the corn in the drill method, the rows being of the same distance as in the common way, placing the corns about five inches asunder. I have found by experiment, that a greater quantity of corn may be produced in this method, than in hills; and the labour is but little, if at all, increased. In a small field where the dung had been evenly spread, and ploughed in, I planted one row thus, the rest being in the common way; and it yielded at harvest, one eighth part more corn by measure than either of the two nearest rows, the corn being equally ripe and good.

When there is reason to apprehend that the ground will prove too moist, for this crop, it will be advisable to plough it into narrow ridges, and seed each ridge with one or two rows, as shall be found most convenient. Some of the finest crops that I have known, have been raised in this method.

When a season is at all wet, this would be the best culture in almost any soil, unless the very driest be excepted.

There is a kind of ridging, which would be very proper for this plant not only on account of drying the soil, but that the land may have an alternate resting, or fallowing, between the rows In the common method of plain ploughing, it commonly happens that a

hill stands precisely in the place of a hill of the preceding year. When this is the case, the plants will receive less nourishment than if the hill had had a new situation. That each hill may always have this advantage, let a ridge be formed by two furrows, turning part of a row of hills on each side, so as to meet each other, in the last year's interval: then small ridges will be formed on which the rows should be planted. If dung be first spread over the ground most of it will be buried where it should be, in the bottom of the ridges. At the time of weeding, the remainder of the old hills may be turned towards the new rows. With such a mode of culture, land could not soon be exhausted, even by a successive cropping with maize.

The uses to which this INVALUABLE plant is applied in the United States are well known. The articles of diet into which it enters as a component part, are various and important. Alone, it is served up in several forms, all of which are excellent. As a strong nourishing food for horses and swine, it is probably superior to any other grain. Many articles will *fatten* animals, but it is corn alone upon which we depend for obtaining that *solidity* in the fat and muscle which are so valuable in slaughtered animals. Experience proves that corn *broken* by a mill, will go one third further in feeding beasts, than when given whole. The stalks and blades of corn, if carefully stacked and cut, have been found good food for horses. By a powerful cutting box the stalks and blades were cut small, and given sometimes alone, and sometimes with oats, and were observed to increase the spirits and flesh of the animals in a very sensible manner. The reason is evident; the stalks, especially the two lower joints, abound with sugar, and was extracted during our revolutionary war; and sugar is one of the most nutritious principles in nature. Considering the importance of the use of the stalks, it is truly melancholy to see acres covered with them in winter, in some parts, instead of having them housed for the cattle. In the Venetian territory, according to the late doctor SCANDELLA, the blades of corn are pulled, dried, and given to cattle without injury to the crops of corn, and Mr. BORDLEY says, he stripped 150 hills of corn, and cut off the tops when the corn was not hard, without any difference being observed between the stalks so treated, and the rest of the field. Dr. S. also states that corn is sown broad cast, upon highly manured places near the stable, and when it reaches its highest growth, and the tassels begin to wither, the stalks are cut down morning and evening, and given to the cattle in the stables. These facts may be useful to those who want fodder, and have corn, but barley straw or hay, ought to be cut with green corn, or blades and tops, to prevent the beasts from becoming *hoven*. It has already been said that the *cobs* of corn are chopped fine by mills for cattle in Lancaster county.

CORN-BERRIES, or Cranberries: See BILBERRY.

CORN-CHAFER, or *Curculio granarius*, L. a species of insects bearing a resemblance to oblong, soft worms. They are provided anteriorly with six scaly legs, and their head is likewise covered with scales Some species of these larvæ are dreaded for the mischief they do in granaries; as they find means to introduce themselves, while small, into grains of corn, and there fix their abode. It is very difficult to discover them, for they lie concealed within the grain, grow slowly, and enlarge their habitation, in proportion to their size, at the expense of the interior meal, on which they feed.

Corn-lofts are frequently laid waste by these numerous insects, which devour immense quantities of grain. When the corn-chafer, after having consumed all the meal, has attained its full size, it remains within the grain, hides itself under the empty husk, and subsists alone: there it undergoes its transformation, and becomes a chrysalis; nor does it leave the grain, till a perfect insect, when it makes its way through the husk.

A correspondent has communicated the following recipe for extirpating these predatory vermin, or preventing their devastations in granaries: Take three or four handfuls of the purple loose-strife, or willow herb, or grass-polly, *Lythrum Salicaria*, L six or eight handfuls of water-pepper, or bitten snakeweed, *Polygonum Hydropiper*, L. and two handfuls of narrow-leaved pepperwort or dittander, *Lepidium ruderale*, L. put them together in a capacious vessel filled with water, several inches above the herbs, and boil the whole from 15 to 30 minutes, by a moderate heat After taking it from the fire, add four or six onions, a few cloves of garlic, and half

a pound of Epsom salt. When cold, sprinkle the floor and walls of the granary with this decoction; and, if the former be constructed of clay, the sprinkling must be two or three times repeated. The herbs here employed, should not be gathered or decocted, till they are immediately wanted, as they would lose their efficacy by long keeping: hence, the months of June and July are the most proper seasons for collecting them. Lastly, the floor ought to be previously swept, and completely cleared of all impurities, so that the decoction may be applied as a preventive, in the months of August and September.

CORNEL-TREE, or *Cornus*, L. a genus of plants comprising twelve species, of which only two are indigenous.

1. The *sanguinea*, wild cornel-tree, or dog-wood, which is chiefly found in woods and hedges. It produces white flowers, which are in bloom in the month of June, and are succeeded by round berries. The wood of this species is hard and smooth, and is chiefly employed in turnery-ware. Its leaves change to a deep blood-colour in autumn. The berries are bitter, and dye purple; on account of their cooling and astringent nature, they are said to strengthen the stomach; stop fluxes of every kind, and to be very serviceable in fevers, especially if accompanied with a diarrhœa. From one bushel of the kernels of these berries, 16 lb of lamp oil were obtained by expression. The plant is eaten by horses, sheep, and goats, but refused by cows.

2. The *suecica*, or dwarf cornel, which is found in mountainous situations, chiefly on the Cheviot-hills, in Northumberland; and in some parts of Yorkshire and Scotland. It is perennial, produces white blossoms, that appear in June or July, and are succeeded by red berries, which are eaten by the Swedes.

Six species of the *Cornus* grow in Pennsylvania, and in various parts of the United States. The most useful are:

1. *C. Florida*, Dogwood, or Boxwood of the New-England states.

This is a useful shrub, growing in almost every part of the United States. It flowers very early in the spring, and makes a fine appearance The bark which possesses considerable astringency, furnishes us with a domestic medicine, and when used in infusion with black alder (*prinos verticillatus*,) or with the roots of the sassafras (*laurus sasafras*) or of tulip poplar tree (*liriodendron tulipifera*) forms an excellent remedy in intermittents. 2. *Cornus Sericea, red willow, rose willow, blue berried dogwood;* leaves ovate, ferruginous, silky underneath; it grows about six feet high, with an upright, round, branched, grey stem; the shoots are of a beautiful red colour in winter, and are said to furnish our Indians with a red dye; the bunches of white flowers which come out in August and September, and grow at the extremity of every branch, give to this shrub a fine appearance. It grows in wet places, and is used as a substitute for the Peruvian bark, to which it is but little inferior, if not equal in virtue. A chemical analysis should be made of this valuable native production, by the medical gentlemen in the country during their leisure hours.

CORN-ROSE. See RED POPPY.

CORN-SALAD, or Lamb's Lettuce, *Valeriana locusta*, L. is an annual indigenous plant growing in corn-fields, and producing white-reddish flowers from April to June. It is eaten by cattle, and its young leaves are cut and used in spring and autumn as a salad, being esteemed little inferior to young lettuce. Sheep and canary-birds are equally fond of this vegetable.

CORNS, in surgery, are hard excrescences, consisting of indurations of the true skin, which arise on the toes, and sometimes on the sides of the feet, where these are much exposed to the pressure of narrow shoes. By degrees, they extend farther down between the muscular fibres on those parts, and occasion extreme pain. [They grow conically, downward; the base of the cone is external.—T. C.]

Corns universally proceed from pressure by *tight shoes* on some joint. The means of prevention are, therefore, obvious, and within the reach of every one: but when corns have appeared, they must be carefully pared with a sharp penknife, so as not to draw blood, and covered with a plaster of diachylon.

MR. ANTHONY CARLISLE, surgeon to the Westminster-hospital, in the seventh volume of *Medical Facts*, gives an ingenious account of the formation and texture of the cuticle, and thence proceeds to show the cause of corns. The cuticle, which is formed, he thinks, of coagulate lymph, is composed of laminæ of different degrees of thickness. When injured by pressure, the most usual cause of corns, it is

thrust off by new layers of cuticle, formed underneath it; if the new layer be formed before the old one loses its hold, the two will be interwoven together; and if the pressure which occasioned the injury be continued, new layers will go on to be formed, and at length the true skin will be removed by absorption, thus allowing the diseased mass of cuticle to sink below the level of the living parts; hence a cone of cuticle is formed, with its apex protruded among sensible substances. Corns may be dissolved, by first soaking in warm water, and afterwards applying the liquid caustic alkali. The management of this process, he says, requires some address, and often considerable patience and perseverance. A more tedious method is by the application of adhesive plaster, spread on leather, having a hole in the centre; by this means, a pressure is made on the parts round the corn, by which the root will in time be protruded. This process is perfectly safe, but often requires five or six weeks for its accomplishment. A third method is by blister: the corn is to be cut close, and then a strong blistering plaster is to be applied, extending a little beyond its circumference. This is particularly used for soft corns.

CORNUCOPIA, the *horn of plenty*, or *Amalthea's* horn, a source whence, according to the ancient poets, every production of the earth was lavished.

COROL, or *Corolla*. See BOTANY.

COROLLARY, is an useful consequence drawn from something already advanced or demonstrated: thus it being demonstrated that a triangle which has two equal sides, has also two angles equal; this corollary will follow, that a triangle which has its three sides equal, has also its three angles equal.

CORONER, an officer whose duties are somewhat of the nature of those of a sheriff. A coroner is to inquire, with the assistance of a jury, into the cause of the death of any person dying by unnatural means, or in prison. If, by this inquest of murder, suspicion is found to attach to any one, he is to commit the suspected party for farther trial.

A coroner is also a substitute for the sheriff; and is to act whenever that officer is supposed to be interested in a process.

CORPORATION, a body politic or incorporate, so called, because the persons or members are joined in one body, and thus qualified to take, grant, and do any other act necessary to the common concern. By means of corporations, powers and properties are erected and perpetuated independently of the individuals incorporated. The utility of these institutions may be strongly doubted.

CORPULENCY, or obesity, in physiology, is the accumulation of too great a quantity of *fat* or animal oil, which distends the solids to an unnatural degree, by the abundance collected in the adipose membrane.

[Corpulency arises from, 1. Too much food, particularly fat of animals. 2. Too little exercise 3. Too much sleep. 4. Too much indulgence in fermented liquors, that destroy and exhaust muscular force, such as beer, wine, spiritous beverage.—T. C.]

Castile soap has been employed with success, and is strongly recommended in a discourse, "*On the Causes, Nature, and Cure of Corpulency*," by Dr. FLEMYNG, who directs from one to four drachms to be dissolved in a gill or more of soft water, and to be taken every night previously to going to repose.

CORVORANTS, or *Pelecans*, a tribe of birds distinguished by their bills being hooked at the end, and furnished with a nail at the point and a pouch beneath; and having their face naked.

There are more than thirty known species, some of which are found in nearly every part of the world.

Of these the most remarkable species is the great, or White Pelecan (*Pelecanus onocrotalus.*) It is furnished with a bag attached to the lower mandible of its bill, so large as to be capable of containing a great number of fish On these the pelecan feeds, and by means of this bag is enabled to convey them as food for its offspring. We are informed that the inhabitants of Mexico sometimes obtain a supply of fish by cruelly breaking the wing of a live pelecan, and then tying the bird to a tree. Its screams are said to attract other pelecans to the place, which give up a portion of the provisions they have collected to their imprisoned companion. As soon as this is observed the men who are concealed at a little distance, rush to the spot, and take away all except a small portion sufficient for the support of the prisoner.

The Chinese train one of the species (*Pelecanus sinensis*) to catch fish, and the birds are so well trained that they do not appear to swallow any, but such as are given to them for encouragement and food.

CORUNDUM, or *Adamantine Spar*, is a very hard and nearly opaque stone, which varies much in colour, but is chiefly grey, with a greenish, brown, or blueish tint.

It is usually found in the form of a six-sided prism, but sometimes occurs in shapeless masses, has a foliated texture, and is about four times as heavy as water.

The name of adamantine spar has been given by the British lapidaries to this substance, from its hardness, which nearly approaches to that of the diamond. It was originally discovered amongst the granite rocks of China; but has since been found, and in greater purity, in Bengal and Ceylon.

In a powdered state it has long been used by the artists of India and China for the cutting and polishing of precious stones; but, though it will in some degree operate upon the diamond, it is not sufficiently hard to bring out the peculiar beauty of that gem in a degree at all comparable to that which is effected by the European lapidaries with diamond powder. The Chinese use adamantine spar for polishing steel, and also in the composition of the finer kinds of porcelain or earthen-ware. For the cutting of seals and precious stones the European workmen consider it preferable to emery; but, for minute engraving, it is much inferior to diamond powder.

CORYPHA, the umbrella tree, grows as tall as a ship's mast, and has the largest leaves of any vegetable, being of a size to cover twenty men. These are used as paper, they serve also for covering houses in the room of slates. Most of the books which are shown in Europe for the Egyptian papyrus are made from the leaves of this tree, which is called likewise the fan-palm on account of the leaves folding, when dry, like a fan.

COSMETIC, any medicine or preparation that renders the skin soft and white, or contributes to beautify the complexion. [The best is cold water, air and exercise.—T. C.]

COSMOGONY, in physics, the science or theory of the formation of the world.

COSMOGRAPHY, the description of the world.

COSTIVENESS, in medicine, a retention of the excrements, accompanied with an unusual hardness and dryness, so as to render the evacuations difficult and sometimes painful.

Sedentary persons are peculiarly liable to this complaint, especially those of sanguineous and choleric temperaments; or who are subject to hypochondriac affections, the gout, acute fevers, and bilious disorders.

Costiveness is frequently occasioned by neglecting the usual time of going to stool, and checking the natural tendency to those salutary excretions; by an extraordinary heat of the body, and copious sweats; by taking into the stomach a larger proportion of solid food, than is proper for the quantity of fluids swallowed; and, lastly, by too frequent use of such nutriment as is dry, heating, and difficult of digestion. To those who are afflicted with this complaint, we would recommend to visit the customary retreat every morning, at a stated hour, and thus endeavour to promote the natural evacuation by moderate efforts; even though they may not perhaps be much inclined, and should not at first succeed; for experience has proved, that nature will in this respect, by perseverance, acquire a habit of regularity. The most proper time for that purpose, is either early in the morning, or late in the evening.

In many families costiveness is hereditary. It may also arise from a debilitated state of the intestinal canal, occasioned by diseases, but more frequently from the habitual use of lean meat, game, red port wine, strong malt liquors, and similar articles of food and drink. From whatever cause it may originate, continual exercise in the open air, and abstinence from heating or intoxicating liquors, will be found very beneficial.

Persons subject to costiveness, should avoid drinking wines, strong beer, or spiritous liquors, and eating *fresh* bread, which greatly disposes to costiveness, besides being highly uneconomical. The food ought to be well chewed, and soups abounding with vegetables should compose a part of every day's dinner. Bread composed of one-third Indian corn meal, and two-thirds wheat flour, and eaten the day after being baked, ought to be used. Rye bread is more laxative than wheat, and may be occasionally used. Stewed prunes and roasted apples are also gently laxative. Spinnach when properly dressed is a very pleasant vegetable, and gently laxative, and should be frequently eaten by costive persons. Those who ride much on horseback, are disposed to costiveness, for which a draught of cold water in the morn-

ing is a good remedy. Molasses diluted with water, is a proper drink for costive habits. For medicine, the following may be taken occasionally. Flowers of sulphur, cream of tartar and sugar each one oz. Mix, and take a heaped tea spoonful when going to bed, and another in the morning.

COTTON, a soft downy substance; the production of the *gossypium*, L. or cotton tree, a genus of plants comprising twelve species, all of which are natives of warm climates, though four only are cultivated in fields to a very considerable extent. This plant is propagated by seeds, and when reared in Britain, requires to be kept in a hothouse, where it will produce both seeds and its peculiar down.

In Georgia and South Carolina two kinds of cotton are planted, one of which grows upon the upland, is of a short staple, and has green seed. Another kind of a long staple and silky fineness, having black seed, is cultivated upon the islands on the coast of Georgia and South Carolina, the value of which has increased from two dollars per acre in a state of nature, to thirty, and in many instances to forty dollars per acre, within the last seven years. The salt air, and certain latitudes, (from 29 to 30 deg.) appear to be the chief cause of the great superiority of the Island Cotton over the Upland, for the same soil a few miles off on *the fast land*, yet without saline air, cannot be made to produce cotton of equal quality.

The following mode of cultivating cotton is recommended by Pierce Butler, Esq who successfully plants that article on the island of St. Simons, state of Georgia.

"If the land has been recently cleared, or has long remained fallow, turn it up deep in winter; and in the first week in March bed it up in the following manner. Form 25 beds in 105 square feet of land, (being the space allotted to each able labourer for a day's work); this leaves about four feet, two and one half inches from the centre of one bed, to the centre of the next. The beds should be 3 feet wide, and flat in the middle. About the 15th of March, in the latitude of from 29 to 30°, the cultivator should commence sowing, or, as it is generally termed, planting. The seed should be well scattered in open trenches, made in the centre of the beds, and covered: the proportion of seed is one bushel to one acre; this allows for accidents occasioned by worms, or night chills. The cotton should be well weeded by hoes once every twelve days till blown, and even longer, if there is grass, observing to hoe up, that is *to* the cotton till it pods; and hoe down when the cotton is blown, in order to check the growth of the plant. From the proportion of seed mentioned, the cotton plants will come up plentifully, too much so, to suffer all to remain. They should be thinned moderately at each hoeing. When the plants have got strength and growth, which may be about the third hoeing, to disregard worms and bear drought, they should be thinned according to the fertility of the soil, from six inches to near two feet between the stocks or plants. In rich river grounds the beds should be from 5 to 6 feet apart, measuring from centre to centre; and the cotton plants, when out of the way of worms, from two to three feet apart. It is advisable to top cotton once or twice in rich low grounds, and also to remove the suckers. The latter end of July is generally considered a proper time for topping. *Gypsum* (plaster of Paris) may be used with success on cotton lands *not near the sea*. In river grounds, draining is proper; yet these lands should not be kept too dry. In tide lands, it is beneficial to let the water flow over the land, without retaining it. In river lands a change of crops is necessary. From actual experiment, it has been proved that river tide lands having, the preceding year, had rice sown in them, yielded much more cotton the succeeding year than they would have afforded by a continuation of cotton.

The mere growing of cotton is but a part of the care of the planter; very much depends on classing and cleansing it for market, after it has been housed; sorting before it goes to the jennies, moating and removing any yellow particles, are essential to assure a preference at a common market of competition."

The month of August in South Carolina and Georgia, is the season for commencing the business of picking cotton

The quantity of black seed cotton produced on an acre of Georgia sea island is about 200 lbs.; in Carolina from 130 to 150 lbs.; an acre of upland will commonly produce 300 lbs. of green seed cotton.

The preparation of the ground for cotton is almost entirely effected by the hoe. The plough is scarcely used.

This circumstance is the more to be wondered at, considerng that the southern planters could not fail to see the great diminution of labour effected by that machine in the northern states; and that on land which has been long cultivated, it could be easily used.

After cotton land has been worked two or three years, it is permitted to rest one year, or more, to recruit. During this time, if a crop of the *Cassia Chamæcrista*, (Aquomac bean) already mentioned, were taken, much benefit to the soil would be produced: and it is recommended to the planters to try a comparative experiment upon a small scale to ascertain the point.

The cotton of the island of Bourbon ranks first in price at the London market; that of the Georgia sea-island is the second; the cotton of Pernambuco third, and after these come that of the West India and Levant, according to the attention given in preparing the article for a market. The Bombay, the green seed or upland cotton of the United States, and the Mississippi cotton, are considered in the last class.

Cotton has accomplished for the southern states, what clover and gypsum has for Pennsylvania. The riches of both these have been greatly increased by these particular articles of culture; but with different degrees of rapidity. In 1794, cotton was of so little consequence that it was not thought of by our negotiator in the treaty with England. And yet, twenty-seven millions of pounds weight of American cotton were exported from the United States to Europe, during the year 1802.

It appears, from a great number of facts, that a capacity to produce cotton, really exists in a very extensive portion of the United States. It begins in the southern counties of New Jersey, and in the northern counties of Delaware, Maryland, and Virginia, and continues through the Carolinas, Georgia, Kentucky, and the Mississippi and Ohio territories. The southern line of Pennsylvania continued eastward and westward, seems to be the northern boundary of what may be called *the cotton district of the United States*.

The facts which prove the cotton to be easily produceable in the Delaware and Maryland counties of New Castle and Cecil, are numerous, and it is well ascertained, that during the revolutionary war, cotton was cultivated by several families in Kent, on Delaware, in sufficient quantities to supply them with clothing. It has been raised also, without any uncommon care, in the borough of Wilmington, where it thrived, blossomed, and yellowed in perfection. These facts prove, that much of Delaware is capable of producing cotton. The places in every township and hundred, best adapted to it, are those where the effects of frost are usually the most moderate. This point merits particular attention in South-Jersey, Delaware and Maryland. It is understood, that frosts are less severe near to the Atlantic, and to our salt bays and rivers; it will of course grow equally well in the Jersey counties of Cape May, Cumberland, Salem, and part of Gloucester, and in the Maryland Hartford County. The inducements to raise this clean, excellent and useful raw material in every part of our country are manifest and great. By raising it on Delaware and Chesapeake bays, *manufactures* will *soonest* take place, *soonest* become extensive; and *it is by manufactures that cotton must be supported in price.*

It is our policy to wear all kinds of cotton goods, in preference to those *imported* of wool, silk, flax, hemp and leather.

In relation to this object, one measure is earnestly, but respectfully recommended to the governments of the union, and of the states. It is the introduction of the use of *cotton blankets*, by providing them for the *military*, by land and sea. It is also recommended to the planters and farmers from Delaware and Maryland to Georgia, and the Mississippi, to introduce the use of cotton blankets, rugs, coverlets, and carpets. It is in those large and heavy manufactures that we can consume our cotton, and we see that the consumption of our cotton is an object of the utmost importance, even to our grain and grass farmers. Let our planters order from the English, French, Dutch or German merchants, cotton blankets, rugs, coverlets, and carpets, and other cotton goods, for the use of their families. Let specimens of these new cotton fabrics be placed before our eyes, by daily use, in order that we may learn to imitate them. Let the American cotton sacks be as famous as the woollen sacks of Britain, at least in our southern and south-western states, and let the middle and northern states consider well the vast advantages, which a certain and abundant supply of American cotton, with foreign and American capital, joined to foreign machinery and artists, seem to

promise them. It is certainly a fact of immense and unobserved importance, that we have reached a production of cotton, manifold greater than all the British West India colonies. The effects upon our internal industry and manufactures are the most promising possible, because it is the raw material in the world, most capable of being worked by water mills and other labour-saving machinery, in this scarcely peopled, and well employed country.

In June, 1796, a patent was granted to Mr Robert Miller, calico printer, Dumbartonshire, Scotland, for a method of weaving all kinds of cotton, linen, and worsted-cloths, by means of looms worked by water; and which may be farther facilitated by steam-engines, horses, or any other power: the weaving is performed at considerably less expense, and more expeditiously, than it can be accomplished by the hands of weavers; the cloth thus woven is of a more regular texture, and superior to that wrought by the hand. But as this patent relates purely to a mechanical operation, solely calculated for manufacturers, we refer the reader to the 8th vol. of the *Repertory of Arts and Manufactures*

Cotton Manufactory. When these United States were colonies of Great Britain, it was the policy of that country to prevent us from manufacturing our own clothing; and the only thing that reconciled the ministry to a peace, was, the prospect of our becoming one of their best customers. The prejudices of Americans, who thought the country too young for manufacturing; and, that the arts, by introducing luxury, would also introduce vice, and wean them from that simplicity of manners which was believed, exclusively, to belong to the agricultural life; the predilection which nearly half the community, especially the rich, had for the [illegible] country: and the influence which the merchants have had in our councils: all *continued to prevent* the introduction of clothing manufactories into these states.

Time, however, and experience, have demonstrated, that luxury and vice may find their way into a country where manufacturing is discouraged; that, *by a spirit of traffic*, foreign luxuries are introduced; and a restless, migratory life, robs a nation of its innocence and simplicity. Years have weaned many from their attachment to England, and the intelligent part of the merchants that commerce would increase by multiplying and diversifying the objects of our industry. And, what is more, the general government, which has hitherto thought of nothing but revenue, are convinced that clothing and other useful manufactures may be protected, as they are in England, without throwing down their idol revenue.

Under these impressions the editor (Dr Mease), thinks it his duty to lay before his readers such a view of the cotton manufactory, as is consistent with the plan of this work, and for which he is indebted to a friend who has a *practical* knowledge of the subject on which he writes

Since the introduction of machinery into this manufactory, the power of establishing it, in any country, rests entirely with the government: and, in this country, with the general government; because it, alone, has the controul over the duties on importation. This will be made evident from the following considerations.

First, by reflecting on the advantages a nation must possess which has already established the cotton manufactory. *There* skilful workmen are collected together, such as mill-wrights to erect the great gears; machine makers, turners, smiths, brass founders, card makers, spinners, weavers, loom makers, reed makers, bleechers, dyers, dressers, &c. all excellent in their kind; and the whole business being organised with so much system, they are enabled to work low, and still have good wages. For these trades are of a sociable disposition, and flourish best near each other. The capitalist can calculate to a fraction what will be the expense of his undertaking, and within a small trifle of the profits resulting therefrom.

But, secondly, if we reflect on the disadvantages a nation labours under where all these trades, and all that skill and organisation, are to be created, and collected together; at what immense expense this is to be done; and how uncertain and precarious the result; it will naturally lead us to this obvious conclusion: That in order to balance the situations of both countries, the *government* must lay protecting duties; and, where fashion is to be combatted, a total prohibition is absolutely necessary. It is true, that an objection has been made, by some people, to prohibitory duties, as being illiberal, and unworthy the generous maxims of republicanism, without perceiving, that this is exactly the universal practice of mankind, and of those also who make

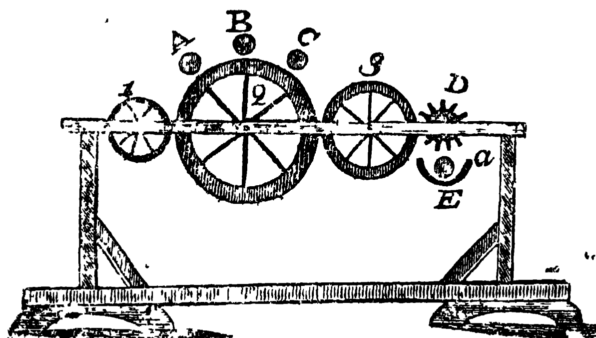
this objection. You have been long accustomed to deal at a certain dry good store a few squares off, for many years, and have been uniformly treated well: but your own son sets up, in the same line of business, next door to yourself, will you say that it is ungenerous or illiberal to order your servant to purchase no longer at the old place? and will you not consider that, although your son charges a little higher, it is all in the family; and will answer the same end as enlarging his fortune? [All this appears to me, very false reasoning. What right has a manufacturer to tax a farmer for his own benefit? Bounties and protecting duties are hot beds: their plants never thrive. They are schemes by which government picks the pocket of the community to enrich a few manufacturers.—T C]

Before the invention of machinery in the cotton manufactory, not more than a million pounds of cotton wool was imported annually into England: but, since that period it has been every year increasing, so that according to *Grelier's View of the Manufactures of Great Britain*, it amounted in the year 1799 to 35,689,000 lbs. and we are assured from other authentic sources of information that it now (1803) amounts to 40 millions.

All the machinery used in the cotton manufactory have been invented in England, if we except the gin for cleaning the wool, which has been a long time used by the French in the West India islands. Of late years it has been introduced with some alterations into the U States, and claimed as a new invention. Another kind of gin has indeed been invented in the United States by Mr Miller, of Georgia, called the saw-gin, for ginning the green seed or upland cotton, which will not pass through the common roller gin. See Gin

We believe it is not known who was the inventor of the cylindrical cards; but every subsequent improver on the art of spinning is indebted to him, for without this invention none of the other processes would have been practicable,

The first carding engines consisted of three cylinders about two feet long each, supported by the axis on a wooden frame on which they lay parallel, and almost touching each other. These were covered round with pieces of leather, full of card teeth. The first cylinder, about a foot in diameter, received the cotton, previously picked and cleaned; and turning slowly round, was received on the middle one, 3 feet in diameter, which moved with great velocity. On this cylinder it was carded by the rollers A, B, and C, clothed also with cards, turning slowly round. The cotton thus carded was stripped from the middle cylinder by the doffing cylinder, 2 feet in diameter, and carried slowly round till it met with the wooden roller D, 3 inches in diameter, which instead of cards, had 9 or 10 pieces of tin, projecting edgewise from the roller, one edge of the tins being fixed in a sawgate made along the whole length of the rollers; as this roller turned round, the flat edges of the projecting tins brushed off the cotton from the cards, in long and broad fleaks, exactly the size of the pieces of leather-carding, nailed on the cylinder. These fleaks fell into the hollow demicylinder, whose end is represented at E, and was by another roller, rolled into a long, round, soft, *roving*, about the thickness of the finger, and at the same time pushed over the edge o...



. This engine was put in motion by a winch fixed upon the centre of the main cylinder, and the motion communicated to the others by bands, which also regulated the relative velocity. This was the construction of the first carding engines; since which, several important improvements have been made, and sometimes alterations without any improvement whatever.

The roving as it fell from the cards, dropt into a basket, by which it was carried, without being incommoded, to the spinning machine, called a Jeanie. These jeanies were at first only constructed with from 10 to 20 spindles, about 3 inches apart, standing upright in a frame of wood, with sockets of brass for the bottom of the spindles to run in; each spindle had a separate band which went round a broad-rimmed wheel that reclined on one side of the machine, at an angle of 45 degrees. This position of the wheel was best adapted for turning with the right hand, while the woman drew out the threads with her left. The rovings from which the threads were spun, were held between two pieces of wood of the same length with the frame which held the spindles. These pieces or bar of wood were supported at the ends upon carriages, with small trucks, which ran upon two other bars of wood placed at right angles with the two ends of the spindle frame. When the woman turned the wheel with the right hand, she took hold of the centre of the two pieces which held the rovings with her left, and drawing towards herself, and from the points of the spindles, drew out a thread of between three and four feet in length, from three inches of the roving.

When the roving was well made from the cards, a beautiful and even thread was made in this way, and as fine as 40 hanks to the pound; or seven dozen cuts, according by the Irish reel.

This machine was invented about the year 1768, in Lancashire, and soon after introduced into Nottinghamshire, for the purpose of spinning stocking yarn.

No improvements were made on this machine until about the year 1775. The manner of conducting the business of spinning at that period was thus: the man of capital had a building suitable for his carding engines, which were driven by horses. He likewise had a number of jeanies in proportion to the quantity of wool delivered from the cards. These jeanies were let out to industrious women of the neighbourhood, who took them to their own homes, paid about half a guinea for learning to spin, and were supplied with work from the same person who had furnished the jeanie, at so much per pound. The yarn was then sold to another manufactory capitalist, who employed weavers to work it up into janes, fustians, corduroys, &c. As yet no fine muslin could be made in England, neither was the printing or dyeing of cotton, well understood. It is believed that at this period, a good red upon cotton could not be made either in printing, or dyeing, in all England.

The improvements that have since been made upon the jeanie, have taken that machine altogether from the women, who worked on them at home. When the machine was increased in size, by adding a number of spindles, even so many as 100, it became too large to be admitted into the houses of the working class. The machine became more complex; for instead of a wheel, as above described, a long tin, or wooden cylinder, about five inches diameter, was contrived to run in a parallel line with the row of spindles, around which the bands were placed. A large wheel (at the side or end of the machine) whose axis was now horizontal was still necessary; and as the operator could not stretch out the left hand to the centre of the machine, and turn the wheel at the same time, contrivances were necessary to bring the handle which turned the wheel, nearer the centre.

When the number of spindles were increased, another improvement presented itself, or rather became necessary. The shortness of the rovings, which could not be more than between two or three feet, viz the length of the cylinders belonging to the carding engine, rendered it necessary that the jeanie should stand still half the time, while the operator joined the rovings. This lost time was not so much perceived, when there were not more than twenty spindles.

Another machine was, therefore, invented, which was called a Billy, by which a young boy or girl could join the roving. And, to preserve them from breaking, they received on this machine, a slight twist to enable them to be wound on a cop.

A frame must now be attached to the jeanie, to hold these cops. The whole machinery at last became so complex, and being carried on in manufacturing

buildings, that it was necessary for men and boys, to perform the whole operation, and women were, in a great measure, driven from the employment.

In the mean while, the attention of practical mechanics was turned to still greater improvements. It was evident, that in order to make the thread of a closer texture, stronger, and still more equal in its size, it would be necessary to lay the fibres of the cotton wool longitudinally, or to lie along the length of the yarn; whereas, by the jeanie spinning, the fibre necessarily goes round the roving, and consequently, cannot be laid even, in spinning. This, however, had been the mode of spinning in England, even when a single thread only was spun from time immemorial. It seems to have been taken from the mode of spinning short sheep's wool, which cotton very much resembles: but the same reason which induces the manufacturer to spin sheep's wool in that manner, does not hold good with respect to cotton. In the former, it is done with an intention of entangling and confusing the fibres, that it may *full* more readily; but as cotton will not *full*, every confusion or derangement of the fibres, weakens the thread, and consequently, the fabric of which it is made.

Richard Arkwright, therefore, for this and other reasons, which shall be noticed in course, invented the method of taking the roving from the cards, so as that all the fibres should lie in parallel lines along the length of the roving. This he accomplished by an alteration in the manner of putting on the cards upon the *doffing* cylinder. Previous to his invention, the cards, with which the cylinders were covered, were in pieces of an oblong form, about six inches in breadth, and nearly as long as the cylinder There was necessarily, a space between each piece, where there were no wires or teeth, and this made a separation in the roving. To avoid this, Mr. Arkwright clothed the *doffing* cylinder with one long piece of card, about two inches in width, and wound it round, spiral-wise, the whole length of the cylinder, fastening it firmly at the ends with small tacks. These are now called fillet cards. It is not unworthy of observation, that when he obtained a patent for his inventions, he never specified this contrivance, and it was on that account that his patent was laid open, after having gained several trials, in which this error had not been noticed.

Besides this fault of not laying the fibres parallel, there is another fundamental error, in jeanie spinning, which will always prevent the equality of the yarn. It is this, three or four inches of the roving is submitted to the draught at one time, whereby, some parts will be drawn finer than others; and it universally holds good, that if there be an inequality in the roving, that inequality will be always increased by this mode of spinning. For, wherever the roving is finest, by being of course weaker, it will draw finer; and wherever it is coarsest, there it will be drawn least, and consequently remain coarser. But this was entirely obviated, by making the roving pass through two pair of rollers. The front pair moving faster than the back pair, draws the roving finer in proportion to the difference of velocity; and, as the rollers are not much farther distant than the length of the fibres of the cotton, the draught must be perfectly equal on every part of the roving, and produce a thread as perfect as wire, that is well drawn.

Another advantage gained by Mr. Arkwright, by these two inventions, was, that the whole process of spinning was capable of being put in motion by the power of horses, water, steam, &c. but for this purpose, he found it necessary to use a fly, or heck (as it called in some places) upon the spindle after the manner of flax or combed wool spinning; a contrivance, which twists and takes up the thread upon the bobbin (or spool) at the same time.

Before Mr. Arkwright had produced to the world a single thread spun in this manner, he had borrowed and expended upwards of 20,000*l.* sterling. He was himself a man of no property. We have heard it often repeated at Nottingham, the town where he erected his first machinery, that when he had drawn 18,000*l.* from Wright, the banker, and still requested more Mr. Wright seemed impatient and doubtful of his success, wishing, at the same time, that he had nothing to do with it, and hoped he would get somebody else to take it off his hands. Arkwright, who was, by that time, perfectly certain, took him at his word, entered into a partnership with Mr Needs, a reputable hosier of that town, who gave him a check upon Wright's bank for the money. In a few years after, Mr. Needs retired from business with a princely fortune; for over and above the great profits derived from spinning, he had a monopoly of the yarn [illegible]

ply his stocking manufactory, which so far excelled in quality the fabrics of any other person, that he could sell more than he could make.

Before we proceed to give an account of further improvements or inventions, we shall enumerate the different processes through which the cotton passes upon ARKWRIGHT's plan. The first moving power of the machinery, is either steam or water. Horses are generally laid aside. The buildings are made to contain from 500 to 1000 spindles. As Mr. ARKWRIGHT purchased none but good clean cotton, there was no necessity for gins, or any machinery to clean the cotton. It was given out to women, to bat and pick out what little there was in it preparatory to its going to the cards. He used two sets of cards, a coarser kind to open it well, and from which it was taken without the trouble of putting it into a roving. The second cards are each attended by a boy to feed, and remove the slivers. These are carried in tin cans to the drawing frame Three of these slivers being united are passed through rollers, which not only unite them in one, but draw them, perhaps, six times finer or smaller than they were before; these are again united by threes and passed through another pair of rollers, and drawn in like manner as before: this operation is performed three or four times, doubling the slivers and drawing them, till at last it comes through the rollers like a fine cob web (the fibres all lying straight and parallel) about an inch broad: it then receives a gentle twist, to enable it to be wound upon a stick about 8 inches long, and half an inch diameter. It is then called a roving.

By these repeated drawings and doublings, it is impossible but it must be perfectly even. The manner of giving the sliver a gentle twist without breaking, or in the least incommoding it, we are told, was the most difficult part of Mr. ARKWRIGHT's invention. Indeed, it would be impossible to discover the method of doing it by reflecting *a priori* on the nature of the thing: it must have been discovered only by patience and numerous experiments The difficulties that he found, however, are evident from the complexity of his apparatus for that purpose. The roving *Can* (as it is called) is now much simplified It is a tin box, about a foot in length, and six or seven inches diameter, fixed on an upright spindle. As the sliver comes through the rollers, in the thin cobweb like manner above described, it falls into the can, which whirling rapidly round, gives it a gentle twist, and coils it neatly up in the inside, until the can is nearly full, when it is taken out by a door on the side, made to open and shut for the purpose. Such a coil may be pressed together and packed up in boxes, without being injured. A boy then winds them on the bobbins or sticks before mentioned, as they are wanted for the spinning frames.

Each spinning frame, upon ARKWRIGHT's plan, contains about 42 spindles on each side, which are about as many as a steady girl can attend. Her business is to piece the threads as they break; to take off the spools as they are full, and put on empty ones; to take the roving bobbins when empty, and supply their place with full ones; to keep the frame clean and well oiled. If the yarn is to be doubled for stockings, there is generally a doubling and twisting machinery in the same building; but if it be intended for the weaver, then it is reeled, and is then fit for sale, or for dyeing, or bleaching. Mr. ELTENHEAD charges for one frame of 84 spindles, to go by water, 500 dollars.

When the manufacturers speak of yarn spun in this manner, it is generally called water twist, or water spinning, in contradistinction to Jeanie spinning, which has been already mentioned, or Mule spinning, which yet remains to be described.

Mr. ARKWRIGHT brought this mode of spinning to perfection in the year 1774, and it is easy to be shewn, that the nation gained more by it, than was lost by the contest with America It was to England a mine of wealth, a rich harvest which she was reaping without the knowledge of her enemies or friends; nay, the government itself was ignorant for several years of the cause of the national prosperity. When it was found out, about twelve years afterwards, RICHARD ARKWRIGHT was made a knight and sheriff of the county of Derby. Just before that, the Scots discovered the mine also; and from that period, Scotland has displayed more enterprise than ever she did before. Ireland, it is believed, was last in this race of wealth. The wretched government of that country has prevented the people from attending to their true interests.

Such were the fortunes gained in a short time by ARKWRIGHT's new mode of spinning, that every man of genius

bent his mind to new improvements and inventions. And when strength and evenness of texture was already attained, the next thing wanted was fineness People were no longer contented with 50 or 60 hanks to the lb. a thing once thought almost impossible. It must be still finer. But it was found, that upon ARKWRIGHT'S principle, viz. (with a fly upon the spindle) it was very difficult to spin finer than 50 hanks. The thread was liable to break by the rapid motion of the fly when such yarn was attempted. Some genius, whose name has not been transmitted to us, hit upon the happy expedient of uniting in one machine the advantages of the Jeanie spinning, which draws out the thread from the end of the spindle—twists it, and then winds it upon the spindle, without a fly—with the two most [illegible] properties of ARKWRIGHT's invention, the continued sliver with the fibres longitudinally, and the rollers. This machine, as partaking of the nature or principles of two machines, was called a mule. It is probable, that it was invented by several ingenious mechanics, who communicated to each other their ideas, freely, on this subject; since no patent was ever taken out for it, though the inventor or inventors certainly deserved it more than hundreds to whom patents have been granted. It has answered the most sanguine expectations, as upwards of 300 hanks of yarn have been spun on it from one pound of cotton.

At first the number of spindles were eighty or an hundred: they are now made to carry 250; and, to complete the whole, they have been made, within these few years, to be turned by water. When this is intended, two mules are set face to face: when the wheel of one mule is turned to draw out the threads, the person who attends them, is putting up, or winding up the threads on the other; and so on, alternately—so that, one skilful person, with the assistance of a girl, to piece the threads as they break, may attend 500 spindles, and each spindle will spin one hank per day.

[It would be desirable to give here a good history, and an account of the present state of planting, picking, carding, spinning, and manufacturing cotton, but the subject is too extensive even for a brief account. The best account of this subject, in the smallest compass that we have seen, is to be found under the articles Cotton, and Cotton Machinery, in Dr. BREWSTER's Encyclopædia, to which we must reluctantly refer our readers.—T. C.]

COTTON-GRASS, or *Eriophorum*, L. a perennial, native genus of plants, consisting of five species.

COTYLEDON. A seed consists of three parts: viz the cotyledons, the radicle, and the plumula, which are usually inclosed in a cover. If we take a garden bean, we may perceive each of these three parts with great ease; for this seed is of so large a size, that all its organs are exceedingly distinct, when we strip off the external coats of the bean, which are [illegible] different degrees of thickness in different parts, we find that it easily divides into two lobes, pretty nearly of [illegible] same size and figure. Each of these lobes [illegible] called a cotyledon.

COUGH, a violent, often involuntary, and sonorous expiration, suddenly expelling the air through the contracted glottis. It is excited by any acrid substance, either chemically or mechanically applied to those passages through which the air enters. These are lined with a membrane so exceedingly sensible, that it cannot bear the mildest stimulus, such as a drop of cold water, without throwing the muscles serving for respiration, into a violent convulsion. Hence the air is expelled with a force sufficient to carry along with it the irritating substance; and thus a cough becomes not only useful, but indispensibly necessary for the preservation of life; as this effort frees the lungs from every kind of stimulating matter, or foulness, which might otherwise be attended with suffocation. A cough is, therefore, an almost inseparable companion of every inflammation of the lungs, as well as every difficulty of breathing; nay, it frequently takes place, when the purest air enters an excoriated sore, or too sensible windpipe, and its tender branches. It may arise from too great an irritability of the nervous system, or even of some particular part, such as the ear; from worms and impurities in the first passages; obstructions of the abdominal viscera; acrimony clogging the glands, and originating frequently from a catarrhal and scrophulous disposition; hysteric weakness; accumulation of sharp humours in the lungs, &c.

[Dr. FRANKLIN used to say he could eat himself into a cold or cough in three days. Nothing more is necessary than high living, hot suppers and warm clothing.—This is true.—[illegible]]

From this view of the ca[illegible] which produce coughs, it will not [illegible] expected that we should expatiate [illegible] treatment of the complaint, un[illegible]er every form and variety of circumst[illegible]ces; we shall, therefore, consider it under the following heads.

I. The *convulsive cough of infants*, in general proceeds from a foul and disordered stomach, in consequence of too viscid and superfluous food, such as porridge, puddings, cakes, gingerbread, confectionary, &c. It is accompanied either with a voracious appetite, or a total [illegible], difficulty of breathing, a tumified hard belly, nausea, and often vomiting. The breath and excrements of [illegible] children are unusually fetid; [illegible]y seldom cough from the breast, but make efforts to vomit, and throw up a viscid phlegm; in consequence of which, they remain easy for a longer time than usual. Their tongue is always impure, and the cough increases in violence, after [illegible].

For the cure of this troublesome complaint, there are no better remedies than gentle emetics and laxatives. A child under one year old, may occasionally take a large tea-spoonful of this mixture; namely, syrup of squills and rose-water, of each one ounce; powdered rhubarb and ipecacuanha, each four grains. The dose may be repeated every half hour, for three or four times, till it produces vomiting; and, in children two or three years of age, it may be somewhat increased, but never to exceed a dessert-spoonful. After the medicine has operated, a clyster, composed of milk and water, with a little oil and sugar, ought to be given, and repeated every other, or third day, while a sparing diet should be strictly observed.

II. The *convulsive cough of adults*, likewise arises from the disordered organs of digestion, and is frequently the lot of tipplers and drunkards. At its commencement there is little or no expectoration; and an inclination to vomit generally precedes a fit of coughing. The treatment of this malady is similar to that of the same species in children, viz. by emetics, but, if the paroxysms should be so severe as to threaten suffocation, we advise, from experience, small doses of calcined zinc, from half a grain to one grain at a time, to be taken in a spoonful of luke-warm water, and be repeated, if necessary, every five or ten minutes.

III The *catarrhal cough*, which is the [illegible]mon, and very frequent, especially in the winter season: See CATARRH. Its immediate cause is a defluxion of humours from the salival glands, chiefly on the trachea or windpipe; thus irritating the throat, and producing fits of coughing. The continuance of such [illegible]rts to expel superfluous matter, generates another cause of the complaint; for, when this humour glides down into the air-vessels of the lungs, it fills many of their cavities, and becomes, in a manner, inspissated, by the continual exhalation of its minutest parts in respiration. The salival humour, thus thickened, by the joint action of the lungs and the air in breathing, is occasionally raised and brought into the mouth, so that in its passages it excites a fit of coughing.

It is a common error, that *all* coughs may be cured by the usual mode of administering oily, diluent, and demulcent remedies. At first, indeed, such medicines may be serviceable, to allay irritation. But, as the compounds of oil, spermaceti, &c. easily turn rancid, and even in a fresh state impair the appetite, and affect the breast, we consider them as extremely precarious: hence, we would prefer the chewing of the extract of liquorice, gum arabic, and similar substances, to all *liquid* preparations. If, however, the cough has made progress, [we must recur to emetics, blisters, warm clothing, abstinence from solid food, and to promote perspiration by warm diluent drinks.—T. C.]

COUGH, *in Farriery*, a disease to which horses are very subject. When injudiciously treated, it is sometimes of long duration; occasions loss of appetite, wasting of the flesh, and, ultimately, consumption. Of this malady there are two principal species; the one is loose, almost continual, and increases to a violent degree, upon the least motion; the other is short and dry, being preceded by a husky, hollow kind of wheezing, apparently arising from obstructed breathing, by the retention of fragments of hay, or corn, in the passage. The latter is usually called an *asthma*, for which mercurial purges are recommended; the animal should first be bled till the inflammation and irritability of the glands are allayed; then a mash should be given, consisting of equal parts of bran and oats, into which, while hot, [20 grains of emetic tartar and 2 oz. of nitre, must be stirred and dissolved. This mash must be repeated for two nights, and then a purging ball of half an oz. of aloes and 30 gr[illegible]

of calomel, made up with flour and molasses, should be given; the calomel to be inclosed in the aloes.—T. C.]

COUHAGE, or cow-itch, as it is erroneously called, *Dolichos pruriens*, L. is an exotic plant, growing in warm climates, especially in the West Indies. It produces crooked, leguminous, coriaceous pods, thickly set with spiculæ, or sharp hairs, which penetrate the skin and cause a violent itching. These spiculæ are used in cases of worms. All the hairy part of one pod, mixed with syrup, or treacle, and taken in the morning fasting, is prescribed as a dose for an adult. The worms appear after taking the second or third dose; and, by means of a brisk laxative, the stools are reported, in some cases, to have consisted almost entirely of worms. Although no inconvenience appears to arise from the internal use of this medicine, we doubt its virtues as a vermifuge.

COW, in zoology, an animal too well known to require any description.

A perfect cow ought to have a long, deer-shaped head, large udder, thin tail, small bones, and short joints.

The use of this animal is equally important for the dairy, and the propagation of its species. For the former purpose, the Alderney breed of red cows is generally preferred, as they are supposed to yield the best milk, though the quantity they produce greatly depends upon the nature and quality of their food.

Grass growing spontaneously on good, sound, meadow land, is in general, deemed the most proper nutriment for those cows which are kept for the supply of the dairy. When, however, green food cannot be procured, the tops and tenderest parts of furze may be chopped, bruised, and given to them. It is affirmed, that this vegetable is greatly superior to fodder; as it increases their milk, without imparting any unpleasant flavour. Carrots, oil cake, cabbages, turnips, potatoes, and beets, are excellent provision, and well calculated to afford beneficial winter-food for this useful animal. [But potatoes should be baked or steamed. In summer, chicory is excellent food, cut green.—T. C.]

The proper daily periods for milking cows, during the summer season, if they are well fed, are *three*, as nearly equi-distant as possible; in the morning, at noon, and in the evening, just before the approach of night. We are well aware that such practice is not generally followed, the cows being milked twice only in twenty-four hours: but experience has amply evinced, that if a cow be milked three times a day, she will yield a greater quantity, and as good, if not better milk, than by drawing her teats only morning and evening.

Every precaution ought to be taken in the choice of milkers. When this manual work is roughly performed, it becomes painful to the cow; but if a soft hand be gently applied, the animal seems rather to receive pleasure, and allows the milk to flow plentifully; as she possesses the singular faculty of retaining or parting with her milk. Indeed, instances have frequently occurred in which one dairy-maid could not obtain a single drop, but another drew the milk in abundance, and without the least difficulty. For the same reason, when cows are *ticklish* (as farmers express it), they should be treated with the most soothing gentleness, and never with harshness or severity. If the udder be hard and painful, it should be tenderly fomented with luke warm water, and gently rubbed, in order to bring the creature into a good temper. Thus, she will suffer the milk to flow without restraint; whereas, if she retain, and not allow it to be drawn off freely, it will prevent her from yielding the accumulated quantity, and eventually dry up her udder. When a cow has been milked for a series of years, and begins to grow old, the most advantageous mode that can be adopted, will be that of *making her dry*, gradually.

Cows intended for breeding, should be selected from those which give abundance of milk. For about three months previously to calving, if in the spring, they should be turned into sweet grass; or, if it happen in the winter, they ought to be well fed with the best hay. The day and night after they have calved, they should be kept in the house, and no cold, but luke-warm, water allowed for their drink. On the next day, about noon, they may be turned out, yet regularly taken in, during the night, for three or four successive days; after which, they may be left to themselves. Every night, the cows thus housed should be kept till the morning cold is dissipated, and a draught of warm water given them previously to their going to the field. Without this precaution, they would be apt to *slip* their calves; an accident which, independently of the loss it occasions, cannot fail to weaken them considerably. Where this is the case,

a cow begins to grow old, the most experienced farmers generally cause her to be *spayed;* and after keeping her two or three weeks from the bold, turn her into pasture. Such practice, if properly attended to, may be of considerable advantage, as the cows thus treated will thrive exceedingly, and soon be fit for sale.

In the management of cows, a moderately warm stable is necessary; and if they be curried in the same manner as horses, they not only receive pleasure, but will give their milk more freely. Farther, cows should always be kept clean, laid dry, and have plenty of good water [illegible], in consequence of which, they will produce both more milk, and afford a quantity of rich dung, that will amply repay the trouble and attention bestowed upon them.

In the management of milk-cows, it is essential that they be kept at all times in high health and good condition. If they are allowed to fall in flesh during winter, an abundant supply of milk need not be expected by bringing them into high condition in summer. So well convinced of this are the Germans, who attend Philadelphia market with milk, that they regularly feed their cows at midnight with short feed, during the winter. [The hollow horn in winter, is always owing to scanty feed; the life is weak in the extremities, which are then easily frozen. —T. C.]. If cows are lean when calving, no management afterwards, will ever bring them to yield, for that season, any thing like the quantity of milk they would have furnished, had they been kept all winter in high condition. Cows ought to be kept to their fullest stretch of milk, from the time of their calving, till grass can be had in abundance. The Germans in Lancaster county, find it economical to have warm stables, as beasts will not eat so much when kept warm, as when shivering with cold.

Pure water is an essential article for cows. Dr. ANDERSON says, he knew a man who acquired great wealth by attending to things of this nature, and one of his principal discoveries was, the importance of having a continued supply of the purest water that could be obtained for his cows, and he would on no account permit a single animal to set a foot into it, nor allow it to be tainted, even by the breath of animals.

Cows in the United States are generally pastured: but the waste attending this practice has already been pointed out. It would be well to try whether cows might not be made to thrive as well by being kept continually in the stall, and at the same time, yield as much or more milk, as when permitted to feed at pleasure in the field.

[Inflamed teats should be washed with two drachms of sugar of lead in a quart of water. Should tumours appear, apply a common warm mash of bran with a little lard.—T. C.]

Lastly, to prevent cows from sucking their own milk, we are informed, that rubbing the teats frequently with the most fetid cheese that can be procured, has proved an effectual remedy.

COW-POCK, *Vaccine*, an eruptive disease, which attacks the udders of cows, and which, when transferred to the human system, effectually secures it from the small-pox.

This disease, which may be justly considered as one of the greatest temporal blessings conferred by Providence upon mankind, was known sixty years ago in Germany, and also the fact of its being a preventive of the small-pox. The same fact was likewise known in the dairy counties of England for nearly the same period, but in both countries the evident application of the important principle connected with it, was unattended to, until Dr. EDWARD JENNER brought it fairly before the public about 20 years since in England. The disease is now found in New-England, among cows. The power of the disease to prevent the small-pox, is at length proved beyond all doubt by *many million experiments* in Europe and the United States.

The distance, as communicated by inoculation, in its commencement much resembles the small-pox. Towards the close of the second day, when the operation takes effect, (that is, 36 to 48 hours, from the period of inserting the virus) a light speck of inflammation is perceived. On the fourth day a minute pimple may be felt rising above the skin, surrounded by a circular inflammation at its base. It now gradually increases in size, and by the close of the fifth day, begins to assume (especially if viewed with a magnifying glass) that appearance which so much distinguishes it from the small pox. This consists in the perfect regularity, and beautifully circumscribed form of the pock, which has a surface flattened, with a depressed centre, of a darker colour, so as to give an appearance of elevated edges. In the small-pox, on the contrary, by the sixth day, the in-

oculated part begins to assume an irregular, or angulated appearance, and its surface is not so flattened in proportion to its diameter. This circumscribed appearance is retained by the cow-pock, (vaccine) during its whole progress, even during the process of its scabbing, while the small-pox becomes daily more irregular, in consequence of the confluence of the adjoining pustules. About the fifth day, the pock begins to change from the red pimple to a vesicle containing a fluid, which through the cuticle much resembles the colour of whey. This fluid is at its first formation, in its most active state, and probably will be less liable to fail, if taken at this early period, than if delayed to a later day. From the *sixth* to the *tenth* is mentioned as the proper period for collecting it. About the eighth or ninth day, the pock having arrived to maturity, the constitutional symptoms begin to shew themselves: the general indisposition being preceded by swelling and pain of the pustule shooting up towards the socket of the arm. Languor, drowsiness, paleness, chilliness, and flushes of heat, headach, pain and fulness of the eyes, loss of appetite, and frequency of pulse follow. The marginal inflammation continues to extend one or two inches in diameter, forming a beautiful efflorescence, or areola, which has been regarded as a proof that the general affection of the system had taken place. This areola, however, does not always exist, and yet the preventive property of the disease is perfect.

The febrile symptoms vary considerably: and sometimes ugly sores are induced by rubbing off the scab in its forming state, or by the friction of clothes. Care must therefore be taken to avoid these causes. For the above observations, we are chiefly indebted to the late excellent publication on the vaccine disease by Dr COXE, which should be in the hands of every practitioner, and master of a family remote from medical aid.

The following concise directions for vaccinating may be found useful:

1. The vaccine pock matter being generally, when first taken from the vesicle, a thin limpid fluid, it becomes, when dried, scarcely visible, either on *glass*, or on the end of a *lancet*, even on a quite new one. If the matter be taken on thread, it will be perceived by the stiffness of it when dried.

2. If the matter is not used immediately on its being taken from the vaccine pock, it will of course be dry; and when employed, it should be softened by the smallest particle of hot water: and, to avoid too great dilution, it should be done by a particle of hot water, hanging on the extremity of a needle.

3. The inoculation must be performed in the same manner as for the small-pox; but it may be useful to recommend, that,

4. Matter be inserted in one place only in each arm, by a very small scratch or puncture of the skin.

5. One armed lancet should be used for only one, or at most two punctures.

6. If the infection take, there will be seen in the inoculated part, in three days, or less, a red spot, like a small gnat bite. In six days, there will be generally a very small vesicle. In nine days, a circular vesicle appears, as large as a pea, often surrounded by a red areola. In twelve days, the red areola will generally surround the vesicle, which then begins to dry, and turn black in the middle.

Between the eighth and eleventh day, a slight fever often takes place.

By the fourteenth day, the vesicle usually changed into a circular dark brown scab, which should by no means be removed, but left to fall off, which it will do in two or three weeks, leaving a pit.

If in four days the gnat-bite appearance be not manifest, the inoculation should be repeated.

7. For inoculation, matter may be taken between the sixth and tenth days, generally.

8. A considerable redness, like Erysipelas, sometimes comes on, and spreads over the arm, about the eleventh or twelfth day, which goes off of itself commonly in a day or two; but cooling applications will often be of service, and never do harm. An emollient poultice should not be applied, except in particular cases of phlegmonous inflammation.

9. The medical treatment is the same as that of the inoculated small-pox.

10. As the vaccine inoculation, as well as the small-pox inoculation, produces sometimes a local affection only, without any perceivable disorder of the constitution, it will be safest, in doubtful cases, to re-inoculate the subject; and if no local disease be produced, or only an imperfect vesicle of a few days duration, sufficient security will have been obtained by the first inoculation.

How to vaccinate several hundred persons with the matter of a single ordinary vaccine pock. From Tilloch's Phil. Mag. vol. 13.

A member of the Vaccine Institution mixed the fluid of a single cow-pock with a drachm measure of water of about the temperature of 70° of Fahrenheit. Of *three* subjects inoculated with this diluted matter, two took the disease in the usual way. The remaining third was inoculated in each arm with one puncture with this diluted matter, and also in each arm, in like manner, with undiluted cow-pock matter; but all these four punctures failed to produce the vaccine disease, the subject being an adult, and probably had had the small-pox.

Though in the above directions the treatment is said to be the same as for the small-pox, yet in many cases, not a particle of medicine has been given, nor has the patient lost an hour. *It cannot be communicated by a near approach to a vaccinated subject, neither has death occurred from it in a single instance.* A gentle dose of medicine, together with abstinence from animal food, are nevertheless proper.

Great care ought to be taken to distinguish between a true and spurious cow-pock. The difference between them, may be easily ascertained by any one who has seen the regular progress of the true pustule. To those who have not seen it, the description above given of it will be sufficient. But if any anxiety remain as to the certainty of having passed through the true disease, Mr. Bryce of Edinburgh, has assured us that all doubts may be dispelled by the following experiment. On the sixth day after vaccination, let the patient be vaccinated again. If the first pock has succeeded, the second pustule will run its course so rapidly as to have its areola, and to terminate about the same period as the first. In a mere local affection, this is not the case; which fact has been tested and confirmed by Dr. Mease. It must be remarked, that in order to derive security from the small-pox, by vaccination, the system must have suffered the latter disease, or at least to have experienced the constitutional symptoms, which probably cannot be the case before the tenth day after vaccination.

The small-pox and vaccine will *sometimes* go through their regular courses at the same time.

Mr. Bryce, surgeon of the Vaccine Institution in Edinburgh, lately announced to the world, that the *scab*, or crusts formed upon the vaccinated part, if partly dissolved in water, will produce the affection with as great certainty and regularity, as with virus newly taken and used in the common way. Dr. Mease has tried the experiment with success, and Drs. Coxe and Dewees, of Philadelphia, have also repeatedly succeeded in communicating the disease with the crust.

CRAB, in fruit-trees, a disease which attacks the bark, especially after transplanting them from the nursery: it destroys particularly the inner bark, by reducing it to a blackish powder, not unlike the smut in wheat.

Various conjectures have been formed, as to the origin of this formidable disorder, which is often very destructive, especially to apple and pear-trees; but none appears to us satisfactory. It is, however, very probable, that it arises from the inattention of gardeners, when transplanting young trees, so as to change their situation to a different point of the compass; for instance, by placing the northern side of the trunk towards the south; where the powerful rays of the sun parch, and in a manner, burn, the tender bark. This supposition is confirmed by the circumstance, that the disease generally makes its first appearance on the south sides of the bark; though, we believe, it also frequently originates from external injuries done to the tree, such as blows, scratches, &c.

The most expeditious method of relieving a tree thus affected, is that of immediately cutting out the whole diseased part, with a very sharp gardener's knife, and not to leave the smallest trace of its discoloration on the trunk: for an imperfect excision is attended with inevitable ruin to the tree. As soon as the operation is performed, the wounded places must be carefully covered with a plaster, made of equal parts of fresh clay, garden-mould, and cow-dung; or with the medication mentioned under the article Canker.

CRAB-TREE, or *Pyrus malus*, L. is an indigenous plant, growing in woods and hedges; it flourishes better on declivities and in shady places, than in open, exposed situations, or on boggy soils. Its blossoms are white, and appear in the month of May.

This is the parent stock, from which the numerous varieties of the apple are obtained, and on which the better sorts of them are grafted because its roots

are neither killed by frost, nor eaten by field-mice Grass, and even corn, will grow beneath it. The wood of the crab-tree is tolerably hard, turns clean on the lathe; and when made into cogs for wheels, acquires a polish, which renders it very durable. The acid juice of the fruit is commonly termed *verjuice*, and is much employed in recent sprains, and in other cases, as an astringent or repellant. This fruit is eaten by horses, cows, sheep, goats, and particularly by hogs, which are extremely fond of it.

CRADLE, a frame joined to a scythe, useful in harvesting, by the help of which, three times the quantity of grain may be cut down in a given time that can be with a sickle, and laid tolerably even for binding in bundles. This machine shall be particularly described and represented under the article SCYTHE.

CRAMP, a kind of numbness, or involuntary contraction of the muscles, attended with a convulsive effort of the neck, arms, legs, &c. as likewise with a violent but transitory pain. Aged, sedentary, infirm, and gouty persons, are peculiarly liable to this complaint, for which a variety of remedies has been tried, with occasional success. Sometimes a garter applied tightly round the limb affected, will speedily remove the complaint. When it is more obstinate, a brick should be heated, wrapped in a flannel bag, and placed at the foot of the bed, against which the person troubled with the cramp may place his feet. The brick will remain warm the whole night, and thus prevent any return. No remedy, however, is equal to warm clothing on the feet at night, and diligent and long continued friction, which will restore the free circulation of the blood in the contracted part, while it is more simple, expeditious, and more safe in its effects.

[If the cramp attack the interior organs, such as the stomach and bowels, it is always attended with danger; being almost always owing to gout: hot strong brandy toddy with laudanum, affords a temporary relief.—T. C.]

CRANE, a machine used for raising large stones and other ponderous bodies. From the numerous accidents which attend the common cranes, several skilful machinists have attempted to contrive such as would be more safe, and at the same time more easy in their operations.

The *first*, in point of time, is that invented by the late ingenious Mr. JAMES FERGUSON; which has three trundles, with different numbers of staves, that may be applied to the cogs of a horizontal wheel with an upright axle, round which is coiled the rope that draws up the weight. This wheel has 96 cogs, the largest trundle 24 staves; the next 12, and the smallest 6; so that the largest revolves four times for one revolution of the wheel; the next 8; and the smallest 16. A winch is occasionally fixed on the axis of either of these trundles, for turning it, in proportion to the weight intended to be drawn up. While this is raising, the ratch-teeth of a wheel slip round below a catch, that falls into them, prevents the crane from turning backwards, and detains the weight in any part of its ascent, if the man who works at the winch, should accidentally quit his hold, or wish to rest himself, before the weight is completely raised.

The *second*, is that invented by Mr ABRAHAM ANDREWS, of Higham Ferrers, Northamptonshire. This machine weighs the body suspended, while it is raising; an improvement for which the *Society for the Encouragement of Arts*, &c. in 1791, granted him a premium of 15 guineas.

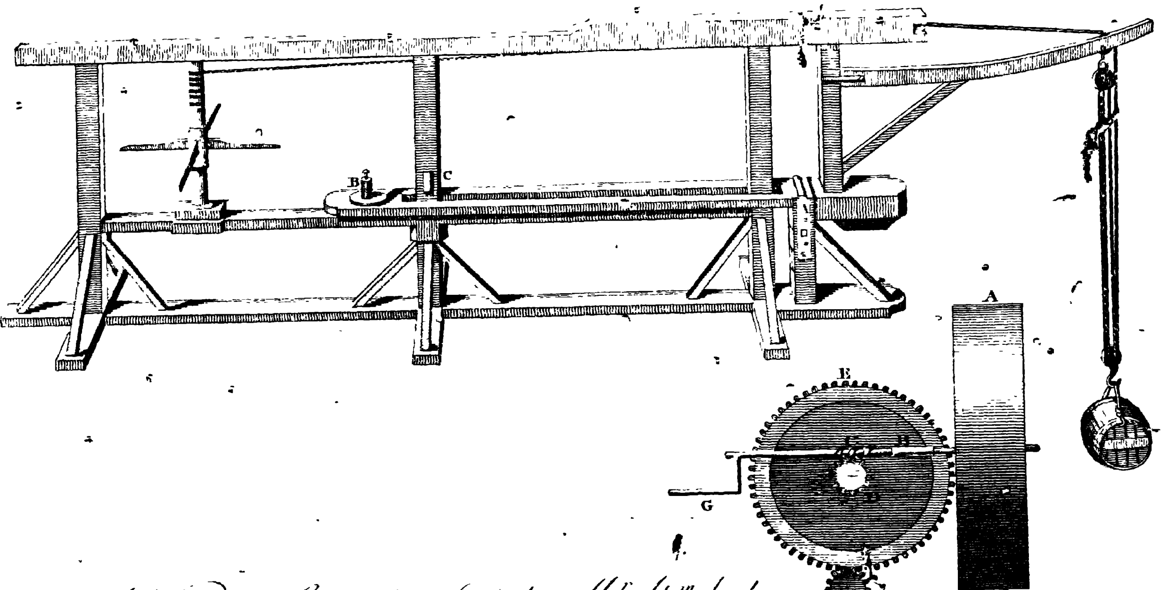
The proportion of the beam in the annexed plate (Fig 1.) is as 1 to 20, the large weight being five pounds, and the smaller a quarter of a pound. The latter, when fixed on the beam-end, will equipoise the former, if hung on the pulley at the end of the gib-beam, which should be placed in a right line with the crane, at the time the weight is adjusted; otherwise it will occasion a friction that may prevent the moveable beam from playing freely.

Description of Mr A Andrews's Crane in the annexed Engraving.

Fig. 1.

The gib of the crane stands on a horizontal beam, moveable on a centre, at *A*; and the distance of the centre, *A*, from the bearing of the upright, being to the distance *B*, in the proportion of 1 to 20, the weight placed at *B*, determines that of the body suspended in the same proportion. *C* is a stub, or piece of wood, which projects from the weight hanging at the end of the gib, and serves to prevent the beam from rising to too great a height

One of the latest improvements in this useful machine, is that proposed by the Rev E. C. in the 2d vol. of the *Repertory of Arts and Manufactures*. It consists simply in introducing the ac-



A Weighing Crane invented by Mr. Wm. Andrews

tion of a worm that communicates the first motion to the crane, upon the axis of the wheel in which the man walks. The axis of this wheel, and that of the worm, are proposed to be in separate parts, and occasionally united by a coupling-box. When goods are to be raised, the two axes should be connected; when lowered, they may be disunited, and the worm turned by a winch. Thus, the ascent, or descent, of the weight may be accelerated, or stopped, at pleasure, by the person walking on the axis of the wheel, or turning the winch; without the remotest possibility of being overpowered by the descending weight.

Explanation of the annexed Engraving. Fig. 2.

A, The wheel in which the man walks.

B, The coupling-box.

C, The worm.

D, The wheel in which it works.

E, A wheel upon the same axis, giving motion to *F*.

F, A wheel upon the axis of the windlas.

G, The winch.

This machinery (the ingenious projector adds) may be applied to a crane already erected upon the common principle. He proposes to put a wheel on any convenient axis in the machine, in its present state; and, on this, a worm that may be thrown in or out of *gear*, at pleasure; and to let the lever, by which it is effected, lie within the reach of the man's hand in the wheel. The goods being fastened to the crane, and raised from the floor of the warehouse, in order to be let down; the man puts the worm into gear, leaves the wheel, and causes them to descend by the winch.

CRANES-BILL, or *Geranium*, L. a genus of plants comprising 145 species.

CRANIOLOGY, a system of physiognomy, invented by Dr. Gall of Vienna. The chief principles on which this is founded are, (1) That the brain is the material organ of the internal faculties. (2) That it contains different organs for different faculties. (3) That we may judge of these different organs and their faculties by the exterior form of the cranium: in other words the formation of the cranium depends on the portion and prominences of the brain, producing corresponding impressions and indentations.

CRAPE, a light transparent stuff, in manner of gauze, made of raw silk, gummed and twisted on the mill, and much used in mourning. The invention came from Bologna; but the chief manufacture of this stuff is said to be at Lyons in France, and at Norwich in England.

CRAYON, a general name for all coloured stones, or other minerals and substances, used in designing or painting in pastel; whether they have been beaten and reduced to a paste, or are used in their primitive consistence, after sawing or cutting them into long narrow slips. In this last manner are red crayons made of blood-stone or red-chalk, and black ones of charcoal and black-lead. Crayons of all other colours are compositions of earths reduced to paste. In painting with crayons, the artist should be apprised of one essential difference which should be observed between the application of colours in crayons and that of colours in oil. Colours used in a dry state have a much greater warmth of complexion than those in a wet one. For this reason, in order to produce a rich picture, a much greater proportion of what painters call "cooling tints," must be applied in crayon painting than would be advisable in oil. To the absence of this consideration, it may be fairly attributed that many oil painters have attempted crayons with but little success; and that crayon painters used to tints that, when wet, are of a cold nature, are apt to introduce them too abundantly when they paint in oil.

[CRAYONS, *black* Take the softest charcoal, such as that of the willow made by the gunpowder makers: melt some bees wax, and put the crayons in it near the fire for half an hour. They will be greatly improved If too soft add rosin: if too hard, add hog's lard to the bees wax.—T. C.]

CREAM, the most oily part of milk it is specifically lighter than the other constituents, collects and floats on the surface, whence it is generally skimmed, in order to separate effectually the caseous and serous parts employed for the making of Butter and Cheese, to which we refer.

Cream is an agreeable and very nourishing article of food, when fresh; but too fat and difficult to be digested by persons of a sedentary life, or possessed of a weak stomach. It is nevertheless of considerable service in medicine, as a lenient (though palliative) application to tetters and erysipelas, which are attended with pain, and proceed from acrid humours.

A method of preserving cream:

Take twelve ounces of white sugar, [and as many grains of finely powdered magnesia.—T. C.] and dissolve them in a small quantity of water, over a moderate fire. After the solution has taken place, 12 ounces of new cream should be immediately added, and the whole uniformly mixed, while hot. Let it then gradually cool, and pour it into a bottle, which must be carefully corked. If kept in a cool place, and not exposed to the air, it may be preserved in a sweet state for several weeks, and even months.

[To preserve cream in long voyages, mix with a quantity of fresh rich cream, half its weight of white sugar in powder; stir the whole well together, and preserve it in bottles well corked. In this state it is ready to mix with tea or coffee, and has continued in good condition during long voyages. One tenth of its weight of calcined magnesia would be an useful addition.—T. C.]

Corsterphin Cream is a kind of bonny-clabber, much esteemed in the vicinity of Edinburgh, where it is prepared in the following manner: A vessel, the bottom of which must be perforated and stopped with a peg, is filled with skimmed milk, and placed within a tub or pail nearly full of boiling water: here it is suffered to remain for 24 or 48 hours, till the milk coagulates, and the watery part has subsided. The latter is then allowed to drain, by withdrawing the peg; when the hole is again closed for 24 hours; at the end of which, an additional quantity of water is drawn off, and the curd generally acquires a due consistence; it is then briskly agitated with a wooden stick, and thus becomes fit for use.

In the summer season, this preparation sweetened, affords an agreeably acid and cooling repast, which is in a certain degree nutritive; though it should not be eaten by those whose digestion is weak or impaired See DAIRY.

CRESS, or Cresses, *Sisymbrium*, L. a genus of plants, of which the principal is the common water-cress, which is found in springs, brooks, and rivulets. It is perennial, and produces white flowers that are in bloom in June or July The leaves have a moderately pungent taste, and penetrating smell, somewhat similar too, though much weaker than that of mustard-seed. Water-cresses are universally used and eaten as an early and wholesome spring salad. Being an excellent antiscorbutic and stomachic, they are nearly allied to scurvy-grass, but do not possess so great a degree of acrimony. They are also supposed to purify the blood and humours, and to open visceral obstructions.

CREUX, a term in sculpture, used by the French in a sense for which there is no corresponding term in the English language. Originally it signified a *hollow* or *cavity*; and in sculpture it is applied where the lines and figures are cut below the surface of the substances engraved, and thus stands opposed to *relievos*, which latter term intimates the prominence of the lines and figures above the surface.

CRICKET, an exercise or game, performed with bats and a ball. This sport was formerly confined solely to the labouring class of people, but it is now becoming daily more fashionable among persons of rank and fortune.

[It is a very manly and interesting game, that deserves to be better known in America than it is.—T. C.]

The number of the party on each side is 11, who alternately take the innings, and alternately the bowling and watching. The essence of the game consists on the one side in an endeavour to knock down the wickets by bowling the ball from one wicket to the other, or in endeavours to catch the ball when struck by those who manage the bats in defending the wickets against its attack; on the other, by striking the ball in such a manner as not to endanger its being caught, and to such a distance as to allow the batters to run and exchange wickets before the ball is returned to either of the bowlers, so that either of the wickets may be knocked down while one of the batters is absent from it, at more than the distance of the length of his bat. Every run from wicket to wicket constitutes a notch, and the game is decided by the number of notches obtained by one party over the other, upon two innings of both.

CRICKET, the COMMON, or Hearth-cricket, *Gryllus domesticus*, L. an insect which delights in new-built houses, where the moisture and softness of the mortar enable it to penetrate between the joints of the bricks or stones, and thus to open communications to different rooms.

Crickets have a great partiality for kitchens and baker's ovens, on account of the continual warmth to be found in those places. They are known by their lively, chirping notes, performed by sudden friction of their wings, or by striking them against their hind legs:

this noise, however, is peculiar to the males, and increases towards night, when they leave their secret haunts. The female deposits her yellowish eggs in the earth, or rubbish, whence the insects emerge in 12 days, and attain their full growth in six or eight weeks, after having four times changed their coats. Towards the latter end of the summer, they are observed to fly; a circumstance which accounts for their suddenly retreating from one place, and appearing at another.

An easy method of destroying this insect, is to place phials, half full of beer, or any other liquid, near their holes, whence they will crawl into them, and cannot escape. Cats are very fond of crickets; but the vast quantities they consume, often occasion their death. Hence it is more advisable to destroy these insects, either by pouring hot-water into the holes through which they retreat, or exposing boiled peas, or carrots, mashed up with quicksilver, in places which they frequent. Another mode of exterminating them, consists in placing pea-straw near their habitations, and then immersing them into water, together with this straw, to which they are peculiarly attached.

CRITICAL DAYS, are those on which it has been supposed the termination of diseases, and especially of continued fevers, has happened; these are the third, fifth, seventh, ninth, eleventh, fourteenth, seventeenth and twentieth.

CROCODILE, *fossil*, one of the greatest curiosities which later ages have produced. It is the skeleton of a large crocodile, almost entire, found at a great depth under ground, and bedded in stone. It was discovered in the side of a large mountain in the midland part of Germany. It had the back and ribs very plain, and was of a much deeper black than the rest of the stone, as is the case in the fossile fishes, which are preserved in this manner. The part of the stone in which the head lay was not found, this being broken off just at the shoulder, but that irregularly, so that in one place a part of the head was visible in its natural form. The two shoulder bones were very fair, and three of the feet were well preserved; the legs were of their natural shape and size, and the feet preserved even to the extremities of the five toes on each of them.

CROISADE, or *crusade*, (from *croix*, French, *crux*, Latin), in the ancient history of Europe, a military expedition of the Christians against the infidels of Palestine, for the conquest of that country. The croisades took place between the year 1096 and 1291; in which latter year the town of Acra was taken by the soldan or sultan of Egypt, and the Christians entirely driven out of Syria. These expeditions are greatly spoken of by Protestants with indiscriminate abuse; but, considering what human history is, they do not, it may appear to impartial eyes, fill a page peculiarly marked with absurdity and bloodshed. War was the business of the barbarians by whom they were undertaken; and the religious ideas they had received were certainly such as to excite, and justify the most enthusiastic actions. On the side of the assailants only, two millions of lives are, indeed, computed to have been sacrificed; thousands of children were led to perish, or to be sold for slaves by their schoolmasters, in the Holy-Land, deluded by the sophistical application of the words, "out of the mouths of babes and sucklings hast thou perfected praise;" with these and a thousand other disasters they may doubtlessly be reproached: that their crimes were such as to impress the Mahometan nations with lasting hatred of the Christian name may also be allowed; that their internal quarrels rendered them despicable foes, and their ferocious manners, infamous conquerors, cannot be denied: but their cruelty was the cruelty of zealots, the dictation of ignorance. When by the result of temporary success, Jerusalem fell into their hands, the garrison was put to the sword, and the inhabitants, men, women, sucking children, massacred without distinction; and defenceless females butchered in the caves to which they had fled for refuge: yet these were not the actions of Atheists, of men who set Heaven at defiance, or of monsters, without regard, without affection for their fellow creatures, or even high notions of moral rectitude; these were the gallant knights of whom christendom has boasted, and of whom she continues to boast; these were they whom so many maidens loved, and by whom so many maidens were protected; and who, even in the very moment of their fury, marched over its dying victims toward the holy sepulchre, and there, while the blood was yet warm on their hands, sung anthems to the Son of God, and burst into tears of gratitude for their victory. Of the tur

pitude of the croisaders, something is to be attributed to the age, and something to zeal, which never yet was in arms without being ferocious; and posterity may forgive the men by whom, through the energies which they called into action, and the learning and refinement which they were the means of bringing from the countries they ravaged, it has been taught to perceive and renounce the errors of which they were guilty.

CROMLECH, a term known in British Antiquities to denote large, broad, flat stones raised upon other stones, set up to support them. They are common in Anglesea, and are by some supposed to be remains of sepulchres, by others to be altars. They may indeed have been both, being originally reared as tombs, and afterwards used as altars.

[CROP. The produce of a field artificially cultivated. Practice has fully established the following axioms. 1st. Two crops of grain should not succeed each other: they should be separated by potatoes, clover, grass, turnips, beets or carrots, for stall feeding 2dly. Good agriculture requires no fallows: fallow-crops that compel you to keep the ground clean while they are growing, answer the purpose. 3dly. Manure at least once in four years.—T. C.]

CROSS, instead of a signature in writing, is derived from the Saxon custom of affixing the sign of the cross, whether the affixer could write or otherwise.

CROSS-BOW, also called the *arbalest*, receives the former name from its figure; the machine consisting of a steel-bow, fixed at the end of a short shaft or stock, furnished with a string or trigger. It serves to expel bullets, stones, arrows, and darts.

CROTALUS, the rattle-snake, a genus of serpents furnished with poisonous fangs. The serpents of this family seldom bite except when irritated, or for the purpose of securing their prey. Their possession of the fascinating power which has been attributed to them, is uncertain; the fact, that small birds, squirrels, and leverets, descend spontaneously, from the branches of the tree under which the rattle-snake lies, and are devoured by it, seems to be generally admitted, though it is very difficult to be accounted for. The more common opinion is, that the animals thus devoured, are in the first place terrified by the noise of the snake's rattle, and hence lose all power of self-government, or continue to fly from branch to branch till they are so exhausted as to be compelled to fall down within its reach. The rattle consists of hollow, hard, dry, and semi-transparent bones resembling in some measure, the shape of the human *os sacrum:* the tip of every uppermost bone runs within two of the bones below it; by which contrivance they have not only a moveable coherence, but also are enabled to make a more multiplied sound, each bone hitting against the other two at the same time. The number of joints in the rattle of individuals is various, from five to forty. The poisonous secretion is discharged from the fangs of the dog teeth, or tusks placed without the upper jaws, after the manner of the viper, and after the first time the animal seems progressively to lose its power of poisoning, till it has had time to recruit itself by a respite of some hours: so that the second bite, if given immediately after the first, does not prove so injurious, the third still less so, and the fourth does, perhaps, scarcely any mischief at all.

CROTON, or wild ricinus, is a botanical genus containing 51 species, of which may be noticed, the *croton tinctorium*, or turnsole, which is used as a colouring matter in various arts and chemical processes: the substance thus used is found between the empalement and the seeds: *croton sebiferum*, or tallow tree, is a native of China, about the size of a cherry tree. The fruit is enclosed in a pod, and consists of three round white grains of the size of an ordinary hazel nut, with a small stone in the interior. From the kernels or expressed oil, the Chinese obtain tallow, of which they make their candles.

CROTOPHAGA, a genus of birds, natives of South America, noticed on account of a curious peculiarity belonging to the females, several of which lay their eggs in the same nest, which is the united work of them all. Each contributes, likewise, her share to the general process of incubation, and to provide food for the common family. These birds are said to pick out the acari from the backs of cattle infested with them, for which purpose they lie down spontaneously.

CROWN, an ornament worn on the head by kings, sovereign princes, and nobles, as a mark of dignity. In heraldry, it is used for the representation of that ornament in the mantling of an armory, to express the dignity of pe-

cus. The Romans had various kinds of crowns, as 1. The oval crown, made of myrtle, and bestowed on victorious generals. 2. The naval crown, composed of a circle of gold, with ornaments representing the beaks of ships, and given to the officers or men who first boarded an enemy's ship. 3 The crown given as a reward to him who first forced the enemy's intrenchments. 4. The mural crown, given to him who first mounted the wall of a besieged place, and there lodged a standard. 5. The civic crown, made of the branch of a green oak, and given him who had saved the life of a citizen. These and other crowns were given as marks of honour, and upon competitions with rivals for rank and dignity, often determined the preference in their favour.

CRUCIBLE, a vessel made of earth, and so tempered and baked as to endure the greatest fire. It is used in chemical operations, and by workers in gold and silver.

CRUISER, from the German *kruiss*, "across," a small armed vessel that sails to and fro in quest of the enemy, and to secure those of its own nation.

CRUOR, sometimes signifies the blood in general; sometimes only the venous blood, and at others extravasated or coagulated blood: but the word is most frequently used for the red globules of blood, in contradistinction to the limpid or serous part.

CRUSTACEOUS FISH, are those covered with shells consisting of several pieces or scales, as those of crabs, lobsters, &c. These are generally softer than the shells of the testaceous fish, which consist of a single piece, and commonly thicker and stronger than the former, such as those of the oyster, scallop, cockle, &c. The crustacea consist almost entirely of the three tribes, viz. cancer, oniscus, and monoculus.

CRYPTOGAMIA, the 24th class of vegetables in the Linnæan system; comprehending those whose fructification is concealed or inconspicuous, as ferns, mosses, liverworts, and mushrooms. See BOTANY.

CRYSTAL. See CHRYSTAL.

CUBE, a regular solid body, consisting of six square and equal sides, and the angles all right, and therefore equal.

CUBE-ROOT of any number or quantity, is such a number or quantity as, if multiplied by itself—and then the product thence arising by that number or quantity, being the cube-root—this last product shall be equal to the number or quantity whereof it is the cube-root: thus 2 is the cube-root of 8; because two times two is 4, two times 4 is 8.

CUCKOW, the COMMON, or *Cuculus canorus*, L. is a native of Africa, whence it visits Great Britain about the middle of April, and continues there till the end of June, or beginning of July. It is about 14 inches in length, 25 in breadth, and weighs generally about 5 ounces.

This is, perhaps, the most remarkable of the feathered tribe; as it never pairs, nor hatches its own young, but drops *one* of its eggs in the nests of different birds, especially those of the hedge-sparrow. As soon as the eggs are hatched, the young cuckow, with his broad hollow back, turns out the other eggs, as well as the young sparrows. This inimical conduct is analogous to what daily happens in human life; but it is now ascertained, that the cuckow does not ungratefully destroy its foster parent; on the contrary, it soon leaves the nest, as its growth is uncommonly rapid, and its appetite extremely voracious, its food consisting almost entirely of animal substances, such as flies, beetles, snails, grasshoppers, caterpillars, &c. This bird may be, and frequently is, brought up tame, so as to become domesticated. In this state it will eat bread, milk, fruit, insects, eggs, and flesh, whether dressed or raw. When fat, it is esteemed by epicures as a delicious morsel, being little inferior to the land-rail.

Although naturalists have formed various conjectures, to account for the peculiar habit of the cuckow, in abandoning its own eggs, yet, we think, such practice is far from being as unnatural as it has been commonly stigmatised. This sagacious creature lays her eggs at intervals of six or eight days; and, therefore, instinctively deposits them in the nests of other birds, because no fowl could support itself for so many weeks while brooding, nor would it be possible for the cuckow to maintain her voracious offspring.

We add the following little narrative, which is extracted from a paper in the *Philosophical Transactions*, by the Hon. DAINES BARRINGTON: "A hedge-sparrow built her nest in a hawthorn bush in a timber-yard. After she had laid two eggs, a cuckow dropped in a third. The sparrow continued laying as if nothing had happened, till she had laid five, her usual number, and then sat. On inspecting the nest, June

20, 1786, I found that the bird had hatched that morning, and every thing but the young cuckow was thrown out. Under the nest I found one of the young hedge sparrows dead, and one egg by the side of the nest entangled with the coarse woody materials that formed its outside covering. On examining the egg I found one end of the shell a little cracked, and could see that the sparrow it contained was yet alive. It was then restored to the nest, but in a few minutes was thrown out. The egg being suspended by the outside of the nest, was saved a second time from breaking. To see what would happen if the cuckow was removed, I took out the cuckow, and placed the egg containing the hedge-sparrow in its stead. The old birds, during this time, flew about the spot, showing signs of great anxiety; but when I withdrew, they quickly came to the nest again. On looking into it a quarter of an hour afterward, I found the young one completely hatched, warm and lively. The hedge-sparrows were suffered to remain undisturbed with their new charge for three hours, during which time they paid every attention to it, when the cuckow was again put into the nest. The old sparrows had been so much disturbed by these intrusions, that, for some time they showed an unwillingness to come to it: however, at length they came; and, on examining the nest again in a few minutes, I found the young sparrow was tumbled out. It was a second time restored; but again experienced the same fate. From these experiments, and supposing from the feeble appearance of the cuckow, just disengaged from the shell, that it was utterly incapable of displacing either the egg or the young sparrow, I was induced to believe that the old sparrows were the only agents in this seemingly unnatural business: but I afterwards clearly perceived the cause of this strange phenomenon, by discovering the young cuckow in the act of displacing his fellow-nestlings." Mr Jenner remarks, that though nature permits the young cuckow to make this great waste, yet the animals thus destroyed, are not thrown away or rendered useless. At the season when this happens, great numbers of tender quadrupeds and reptiles are seeking provision; and if they find the callow nestlings which have fallen victims to the young cuckow, they are furnished with food well adapted to their peculiar state. To the shortness of its period of residence, joined with the numerous progeny which nature has destined it to yield, Mr. Jenner attributes the motive for this singular arrangement in the economy of nature. By means of this resource, cuckow's eggs are laid in an abundance that could not be effected if the bird was to sit herself; and, beside, the egg laid on the last day before she quits the country is left in careful hands, and the young one follows at a future period.

Another species of the Cuculus or Cuckow genus is the Cuckow Indicator or "Honey-guide," which is an inhabitant of Africa, and has an extraordinary faculty of discovering honey, of which it is very fond. The Dutch farmers and Hottentots near the Cape of Good Hope imitate the sound of this bird in the morning before it goes to feed, which brings it to them, and when it moves off for its repast, they follow, as correctly as possible, the direction of its flight, and scarcely ever fail to arrive at some store of wild honey.

CUCUMBER, or *Cucumis*, L. a genus of exotic plants, consisting of fourteen species, of which the following are the principal:

1. The *Sativa*, or common Cucumber, which is reared in this country, at three different seasons of the year: 1. On hot-beds, for early fruit; 2. Beneath bell, or hand-glasses, for the middle crop; and 3. On the common ground, when designed for a late crop, or for pickling. The Cucumbers gathered before April are unwholesome, on account of their being raised entirely by the heat of dung, without the aid of the sun: those growing after that month, are more salubrious, and are cultivated in the following manner: Towards the latter end of January, a quantity of fresh horse-dung should be procured, with the litter among it, to which a small portion of sea-coal ashes should be added. In the course of four or five days, the dung begins to heat, when a little of it may be drawn flat on the outside, and covered two inches thick with good earth; over which a bell-glass ought to be placed, and, two days after, when the soil is warm, the seeds should be sown, covered with fresh mould, one-fourth of an inch thick, and the glass again set over it. This must be screened with a mat during the night, and in four days the young plants will germinate. As soon as they appear, the rest of the dung must be beaten close together into a

bed for one or more lights, which should be three feet thick, and covered three inches deep with fine fresh earth; the frame is then to be put on; and, during the night, or in bad weather, sheltered with mats. When the soil is hot enough, the young plants must be removed into it, and set at two inches distance, the glasses being occasionally raised, to admit fresh air, and also frequently turned, to prevent the wet steam of the dung from dropping down on the plants. These ought to be watered at stated times, with tepid, or luke-warm water; and, as they increase in size, should be earthed up; an operation which will considerably augment their strength. If the bed be not hot enough, fresh litter should be laid round its sides; but, if it be too warm, they should be perforated with a stake, to give vent to the heat; and, as soon as the bed acquires a proper temperature, the holes are to be closed up with fresh earth. When the plants begin to shoot their third, or rough leaf, another bed should be prepared for them, similar to the first; and, when the soil is thoroughly warmed, they should be transplanted into it, in holes about a foot deep, and nine inches broad, filled with light, fine, fresh mould, laid in a hollow, circular form. In each of these holes four plants should be set, and shaded for two or three days from the heat of the sun, that they may strike root; after which time it will be useful to expose them to the sun, and the air, as often as the weather will permit. When they have attained the height of four or five inches, they should be gently fastened down to the soil, in different directions; and the branches afterwards produced, ought to be treated in a similar manner, as it will much contribute to forward their maturity. In the course of a month, the flowers will appear, and, shortly after, the rudiments of the fruit. The glasses should now be carefully covered during the night, and the plants gently sprinkled with water in the day time These will produce fruit till Midsummer; and may be succeeded by a second crop, which is to be raised nearly in the same manner as the earlier cucumbers; with this only difference, that the former should be sown toward the end of March, or the beginning of April, and that it requires less care and attention.

The proper season for sowing cucumbers of the last crop, or those destined for pickling, is towards the latter end of May, when the weather is settled: they should be set to the number of eight or nine, in shallow holes, and filled up with fine earth. After appearing above ground, they need only be kept clear from weeds, and occasionally watered. Five plants are to be left, at first, in each hole; and, as soon as they have grown a little larger, the worst of them is to be pulled up, so that their number may be reduced to four: this crop will begin to produce fruit in July.

A very ingenious method (we learn from a Foreign Journal) of propagating cucumbers for several crops in succession, without sowing them, has been lately discovered by Mr. BURTON, of Staines-head, Sussex. As soon as there appear several flower-buds on a plant, he bends the second or third joint of a branch below the blossom, fastens it firmly into the ground, and cuts off the capillary point of the plant. The new vegetable speedily takes root, when he separates it from the parent stock. Thus he proceeds with the most vigorous of his plants; and as each root has to supply only a few fruits with nourishment, he saves both room, labour, and time, while this process enables him to procure a constant succession of cucumbers for eight, twelve, and more months, from *one* sort, which is not so liable to degenerate, as if they were raised from a variety of seeds.

Cucumbers are a salubrious cooling fruit, and may be safely allowed to consumptive patients; as they sweeten acrid humours, at the same time are gently laxative: but, being in a considerable degree acescent, and sometimes attended with flatulency and diarrhœa, such effects may be prevented, by eating them in great moderation, or with the addition of vinegar and pepper, which counteract their natural coldness. If properly pickled (without colouring them with that poisonous metal, copper; or rendering them too acrid with stimulant spices), they are an excellent antiseptic, yet we consider them highly improper, either for children or wet-nurses.

The fly, which is often very destructive to cucumbers, melons, and pumpkins, may be killed by sprinkling a mixture of tobacco-water and red pepper over the vines.

A friend of Dr. MEASE, informed him, that some years since, nearly all the cucumbers and melon vines in New Jersey were destroyed by a fly or

bug. One day he had occasion to ride past a miserable hut in the woods, and, perceiving a very flourishing patch of cucumbers, he was induced to dismount and to examine it, upon approaching the spot he found it had formerly been a *charcoal* heap. He took the hint, and by strewing powdered charcoal round about the vines when they first come up, preserves his cucumbers effectually.

Mr. J. W. of Philadelphia, informed Dr. Mease that he enriched the ground near the trunk of a peach tree, and sowed some cucumber seed. which came up very abundantly. He pulled up all the plants but one, and permitted the vine to run up the tree. It bore 150 cucumbers. The numerous creepers with which the cucumber abounds and the result of this experiment would seem to point out the climbing nature of the plant, and the great advantage arising from permitting it to attach itself to a frame or tree, instead of confining it to the ground.

The seeds of melons and cucumbers are liable to run too vigorously to vine before they emit a single fruit. To prevent this, Dr. Darwin advises to wash the seeds clean from their pulp before they are put away for preservation, and to keep them three or four years before they are sown. The experienced Abercrombie (Mawes' Gardener) confirms the advice to plant seeds two, three, or four years old. See also McMahon's Gardening, 2 vols. octavo

2. The *Colocynthis*, Coloquintida, or Bitter Apple, which grows in Syria, and also in the Island of Crete. It produces a yellow fruit, of the size of an orange, and resembling a gourd, the shell or outside of which contains a very light, white, spongy pulp, interspersed with flattish seeds. This pulp, when dried and pulverised, is one of the most violent purgatives: and though it is frequently employed for that purpose, it should be used with caution. It is the basis of the cathartic extract of Fothergill's pill.

CUCURBITACÆ, the name of an order (including the cucumber), in the fragments of Linnæus, consisting of plants which resemble the gourd in external figure, habit, virtues, and sensible qualities. These are divided into two sections. 1. Those with hermaphrodite flowers, as the passion-flower. 2. Those with male and female flowers produced either on the same or distinct roots, as the cucumber, &c. In these the male flowers are generally separate from the female on the same root, and that either in the same angle of the leaves, as in the "sicyos" or serpent cucumber; or in different angles, as in the gourd.

CULEX, the gnat: is produced from an aquatic larva of very singular appearance, which, when first hatched from the egg, measures about the tenth part of an inch. The eggs of the gnat are deposited in groups of three or four hundred together, are extremely small, and are placed on the surface of the water close to the leaf or stalk of some water plant. It feeds on the minute vegetable and animal particles which it finds on the stagnant water, the head being armed with hooks to seize on aquatic insects, and other kinds of food. When arrived at its full growth, it casts its skin and commences chrysalis. In this state, like the larva from which it proceeded, it is locomotive, springing about in the water in a similar manner. When ready to give birth to the included gnat, which usually happens in three or four days, it rises to the surface, and the animal quickly emerges from its confinement. Gnats are very troublesome in all countries, but particularly in Lapland, where the air is literally filled with such swarming myriads, that the inhabitants can scarcely venture out of the smoke of their fires: here however the larva which fill the lakes of Lapland form a delicious and tempting repast to innumerable multitudes of aquatic birds, and thus contribute to the support of the very people which they so dreadfully torment.

CULMIFEROUS PLANTS, in Botany, such as have a smooth jointed stalk, usually hollow, and at each joint, wrapped about with single narrow, sharp pointed leaves. In some species however, the culm is entirely naked, that is, destitute of leaves.

CULMINATION, is the passage of any heavenly body over the meridian, or its greatest altitude for any given day.

CULTIVATOR, is an implement of husbandry, lately invented by Mr. William Lester, of Northampton; for the contrivance of which, the *Society for the Encouragement of Arts*, &c. in 1801, rewarded him with their silver medal. As this instrument promises to be of essential utility to agriculturists, we have given an engraved view of its construction.

Description of Mr. LESTER's *Cultivator.*

A, is the beam.

B, B, the handles.

C, C, is a semi-circular cross-bar, containing several holes, by means of which the two bars D, D, may be placed at a greater or less distance from each other, as occasion may require.

D, D, represents two strong bars, that are moveable at one end upon a pivot marked E; and extend thence, in a triangular form, to the cross-bar C, C. With the former are connected the shares F, the upper ends of which are inserted through square holes, and may thus be fixed at any requisite height.

F, represents those seven shares, the lower extremities of which are shaped like small trowels, while the upper parts consist of square iron bars.

G, G, G, are three iron wheels, serving to move the machine, and which may be raised, or lowered, at pleasure.

H, an iron hook, to which the swingle-tree and horses are to be linked.

When the machine is first employed on land, the bars D, D, are expanded as widely as possible: in proportion as the clods are broken, and the soil becomes loosened, they are brought closer to the centre, so that the shares occupy a smaller space, and consequently the land will be more easily reduced to powder.

The object of Mr. LESTER's invention is, to shorten the labour at present required for breaking up stiff soils; and, as these are most effectually pulverised in dry weather, his implement is peculiarly adapted for such purpose: according to his account, he is confident that one man, a boy, and six horses, will break up as much *fallow-land* in one day, and with the same effect, as six ploughs. In some states of the soil, it will be necessary to alter the breadth of the shares; but this circumstance must be regulated by the judgment of the husbandman; and, though the points of the shares, in consequence of such expansion and contraction of the cultivator, are slightly moved out of the direct line, yet this irregularity does not impede the progress of the implement.

Mr. LESTER's communication is accompanied by the certificate of a farmer, in the vicinity of Northampton, who states, that he employed the *cultivator*, in the summer of 1800, on a turnip-fallow, and believes it to be very useful for cultivating such land; that from its alternate contraction and expansion, it is calculated to work the same soil, in a rough or fine state; by which means it unites the principles of two implements in one; and he is of opinion, that it may be worked at any depth required, for the purposes of general tillage.

CULVERINE, a long slender piece of ordnance, serving to carry a ball to a great distance.

CUMMIN, or *Cuminum Cyminum*, L. is an exotic annual plant, propagated in the Isle of Malta, for the sake of its seeds. They have a bitterish warm taste, accompanied with an aromatic, but not agreeable, flavour; and, though esteemed good carminatives, are seldom employed in medicine. An essential oil is obtained from them by distillation, possessing all the virtues of the seeds, and reputed to be a sovereign remedy in rheumatic cases. They are likewise employed externally, both in the form of a plaster and cataplasm. Lastly, being exceedingly grateful to pigeons, avaricious proprietors of dove-cotes sometimes incorporate the seeds with a saline earth (see PIGEON-HOUSE,) in order to allure these birds; and thus stock their pigeon-houses, at the expense of their neighbours.

CUP-GALLS, a name given to a curious kind of galls found on the leaves of the oak, and some other trees. They contain the worm of a small fly that passed through all its changes in this habitation, being sometimes found in shape of a worm, sometimes in the nymph and sometimes in the fly state, in the cavity.

CUPRESSUS, a genus in Botany, of which the most beautiful species is the horizontal cypress, which is the common timber in some parts of the Levant, and is said to resist the worm, the moth, and putrefaction. The doors of St. Peter's at Rome, which lasted eleven hundred years, to the time of Pope EUGENIUS, were perfectly sound and entire when they were exchanged by that pontiff for gates of brass. The Athenians used to bury their dead in coffins of cypress, and the mummy chests brought with those bodies out of Egypt are made of their wood

CURB, a chain of iron fastened to the lower part of the branches of the bridle, in a hole called the *eye*, and running over the horse's chin or beard. It consists of three parts; namely, the hook fixed to the eye of the branch; a chain of links, and two rings or mailes.

Large round curbs are the best and most easy; but due care should be taken to fix them in their proper place, a little above the beard, and neither too tight nor too slack, otherwise the bit will be of little utility.

CURB, in farriery, is a hard, callous swelling on the hinder part of the hock, attended with stiffness, and sometimes with lameness. It generally arises from hard riding, strains, blows, or kicks; and may at first be easily cured, by three or four times blistering the animal affected. If the tumor continue to indurate, the most expeditious and effectual cure will be to *fire* with a thin iron, drawing several deep lines down the middle, from the top, to the bottom, and then to apply a mild blistering plaster, which will certainly remove the defect.

CURCULIO, a genus of insects of the Coleoptera order, of which the curculio nucum, or nut-weevil, is the insect produced by the maggot residing in the hazel-nut, and is universally known. The female pierces the young nut with its proboscis, and deposits an egg, which is hatched there, and the worm lives on the kernel, till at length the nut falls to the ground, and the insect creeps out of the hole which it has made by gnawing. It burrows under ground, where it lies dormant 7 or 8 months, and then casting its skin commences a chrysalis of the beetle tribe, in due course it casts its skin again and soars an inhabitant of the upper world. Many of the species of foreign and hot climates are large and of extreme beauty, but the most brilliant is the "Imperialis," or diamond beetle, a native of Brazil, which, when seen through a magnifying glass, affords one of the finest sights imaginable.

CURD, is the coagulated part of milk, after the whey is separated. See CREAM

CURDLING, the coagulation of any particular fluid, such as milk. In Tuscany, it is effected by means of artichoke flowers, instead of the rennet employed in Britain. There are, besides, a variety of substances which may be advantageously substituted for either, especially when the whey is intended to be a cooling and antiseptic beverage; for instance, a small quantity of cream of tartar; a few drops of oil of vitriol, or spirit of salt, previously diluted in a spoonful of water, will easily coagulate the milk; after which it should be strained. See CHEESE.

CURING, a term used for preserving fish, flesh, and other animal substances, by adding certain ingredients, to prevent putrefaction. It is also effected by drying the bodies with the smoke of wood, or by rubbing them with salt, nitre, &c. See BEEF and PRESERVATION.

CURRANT-TREE, or *Ribes*, L. is an indigenous plant, comprising 6 or 7 species, of which the following are the principal:

1. The *Rubrum*, or common Red Currant, which is found in woods in the northern counties. It bears greenish white flowers, which blow in the month of May, and are succeeded by red berries. Its leaves are e[illegible]ows, goats, and sheep, but with reluctance by horses. This plant is very liable to be infested by a species of plant-louse, the *Aphis ribes*, the depredations of which change the fine green colour of the leaves, that become red, pitted, and shrivelled. The best method of exterminating these vermin is, by sn[illegible]king the bushes with half-burnt [illegible] or sprinkling them early with decoctions of tobacco, or solutions of lime and pot ash, or simple soap-water.

2. The Sweet White Currant.

3. The *Nigrum*, or Black [illegible], which has woolly flowers [illegible] the month of May. Its leaves are [illegible] by goats and horses.

The different species of currants will thrive on almost any soil; but their fruit is more savoury, when produced in a dry and open ground. They are very easily propagated, by planting slips, or cuttings, in March, upon fresh earth, which should be carefully cleared from all weeds during the spring; and, in dry weather, the young plants ought to be frequently watered. After standing about two years, they will be fit to be removed to those places where they are intended to remain; an operation which should be performed when the leaves are just decayed, so that the plants may have time to strike root before the winter-frosts. If they are designed for standards, they should be planted in rows 8 or 10 feet apart, and the trees in each row 4 feet distant from each other; but the more eligible way is to train them in espaliers, where they take up less room, and their fruit acquires a finer flavour. In this state, they should be placed from 6 to 8 feet apart, and all their branches trained horizontally: the same distance is also to be allowed them, when set against walls or pales

The following directions for the cultivation of the currant are taken from the *Amer. Phil. Trans.* vol. I. 1st series.

Plant them round the quarters in the garden, that they may have the benefit of the manure and culture annually bestowed thereon, which will consequently make the berries large, and the juice rich. The red currant is preferable to the white, as yielding richer juice, and in much greater quantity.

Take the most luxuriant slips or shoots of a year's growth, set them in the ground about eight inches deep, and not less than 24 distant from each other; these never fail of taking root, and generally begin to bear in two years. For the rest, let them, from time to time, be treated as espaliers, (but not against a wall) observing to keep the roots from suckers and grass.

The goodness of the currant depends upon their having the full benefit of the sun and air, to maturate and give the berries a proper balsamic quality, by [illegible] a due proportion of their acid watery particles.

The fruit of the *red* and *white* currants is greatly esteemed for the table. They are nutritive, but should not be too frequently nor abundantly eaten, as [illegible] to produce flatulency, in persons of relaxed habits and sedentary life; hence they ought to be consumed together with other food, in which case they are emollient, gently laxative, and, in some instances anodyne. In fevers, the juice of currants, when mixed with an equal quantity of sugar, and made into a jelly, is cooling and grateful to the stomach; being in a slight degree astringent and antiseptic.

Currant Wine is an excellent drink during the heat of summer, especially with the addition of water. Different recipes have been given for making this pleasant beverage. We select the following, from the *Amer. Phil. Trans.* vol. 1. Gather the currants when they are fully ripe; break them into a tub, or vat; then press and measure the juice, to which add two-thirds of water, and to each gallon of that mixture put 2½ lbs. of soft sugar; agitate the whole properly till the sugar is dissolved, when it may be barrelled. The juice should not be left to stand during the night, as the fermentation ought not to take place, till all the ingredients are compounded.

Observe that the casks be sweet and clean, and such as never had either beer or cyder in them; and, if new, let them be well seasoned.

Do not fill the casks too full, otherwise they will work out at the bung which will injure the wine; rather make a proportional quantity over and above, that after drawing off the wine, a sufficient quantity may be left to fill up the casks. Lay the bung lightly on the hole, to prevent flies, &c from creeping in. In three weeks or a month after making, the bung hole may be stopped up, leaving only the vent hole open till it has fully done working, which generally is about the latter end of October: [then add half a pint of very good brandy to each gallon.—T. C.] It may then be racked off into other clear clean casks, but experience seems to favour the letting the wine stand on the lees till spring, as it thereby attains a stronger body, and is by that means in a great measure divested of that sweet, luscious taste, peculiar to all made wines; nay, if it be not wanted for present consumption, it may without damage stand two years on the lees.

When you draw off the wine, bore a hole an inch at least above the tap hole, a little to the side of it, that it may run clear off the lees. The lees may either be distilled, which will yield a fine spirit, or filtered through flannel or sand, and returned again into the cask.

In regard to the quantity of wine intended to be made, take this example, remembering that 12 pounds of sugar are equal to a gallon of liquid.

For instance, suppose you intend to make 28 gallons; then there must be,

8 gallons of juice,
16 of water,
——
24 galls. mixture,
4 galls. produced by sugar,
——
28 gallons.

A common cyder press, if thoroughly clean will do well in making large quantities; the small hand screw press is most convenient for such as make less. An extraordinary good spirit may be distilled from currant juice, by adding a quart of molasses to a gallon of juice, to give it a proper fermentation.

The following recipe has been used successfully.

Take 20 lbs. of currants when fully ripe, 3 gallons cold water; break the currants into water and let them be therein two or three days, and stir once each day. Strain the liquor from the fruit and stalks and add 14 lbs. sugar,

which being well mixed with the currant liquor, the whole may then be barrelled and left 14 days without the bung; after which bung it close and bottle at Christmas, previously adding to every 8 gallons one quart of brandy. In procuring the currants care should be taken not to permit any unripe fruit to go amongst the liquor. The sugar should be of a good quality. If the flavour of orange peel (which is grateful in most wines of this description) is desired, a small quantity of the outer rind of the orange peel will give it a grateful flavour.

From the quantity of currants which made one barrel of wine, another friend, J. P. Esq. of Darby, calculated that one acre planted with currant bushes would produce fifty barrels of wine.

Black Currants have a peculiar flavour which many persons dislike; they are, however, reputed to be very wholesome, and their juice is frequently boiled down into an extract or syrup, with the addition of a small quantity of sugar; in which state it is called *rob*, and much esteemed in sore-throats and quinsies. Some persons put black currants into brandy, for the same purpose as others do cherries; compositions that are less adapted to the benefit of health, than to stimulate the corrupted palate of dram-drinkers. An infusion of the young roots of the former, is said to be useful in eruptive fevers of the human species; and in those dysenteric distempers with which cattle are sometimes affected.

CURRYING, the art of dressing cow-hides, calf-skins, &c. The principal object in this process, is to soften and supple cow and calf-skins, which are usually employed in making upper-leathers and quarters of shoes, the covers of saddles, coaches, &c. As soon as these skins are brought from the tanner's yard, the currier first soaks them for some time in common water, when he takes them out, stretches them on a smooth wooden horse, scrapes off with a *paring knife* all the superfluous flesh, and immerses them again. They are next put on a wet hurdle, and trampled with the heels, till they become soft and pliant, when they are steeped in train oil, and afterwards spread out on large tables, and their ends tightly secured. There, by means of a *pummel* (an instrument consisting of a thick piece of wood, the lower side of which is full of furrows, or teeth, crossing each other,) the currier folds, squares, and moves the skins in various directions, to render them supple. This operation is properly called *currying*; and with a few immaterial exceptions, is that now generally followed.

After the skins are thus dressed, they are coloured black, white, red, green, &c. which process is performed either on the flesh or *grain* side; that on the former by skinners, and that on the *grain* or *hair* side by curriers: these, when a skin is to be made white, rub it with chalk, or white lead, and afterwards with pumice stone. But when a black colour is wanted, the skin must be first oiled and dried, then passed over a puff dipped in water impregnated with iron, when it is immersed in another water prepared with soot, vinegar, and gum-arabic. Thus it gradually acquires a deep dye, and the operations are repeated till it becomes of a shining black. The grain and wrinkles, which contribute to the pliancy of calves and cows-leather, are made by the reiterated folds given to [illegible] in every direction, and by the great care taken to scrape off every excrescence and hard place on the grain, or colour-side. See COMFREY and TANNING.

CURRYING, a manual operation, performed on horses, with an instrument called a *curry-comb*; it may also be applied to cows, and indeed to all black-cattle, that are much confined to the stall or yard, especially during the winter. Independently of the circumstance, that so useful a practice essentially contributes to the health and kindliness of animals, it also, in a remarkable degree, promotes their thriving and becoming fat. See BULLOCK.

CURTAIN, an article of domestic furniture, consisting generally of calico, dimity, or printed cotton; which may be contracted or expanded at pleasure, and is usually appended to a bedstead, or to windows.

Curtains are at present considered more as an ornament, than as an article of convenience, to beds; and might be easily dispensed with; especially when one person only sleeps in an apartment. These appendages certainly occasion numerous accidents happening from fire; and which often originate from the absurd and reprehensible practice of reading in bed.

CUSTOMS, in political economy, the duties, toll, tribute, or tariff, payable to a state upon merchandise exported and imported, and which form a branch of the perpetual taxes. They were de-

nominated, in the barbarous Latin of the ancient English records, "custuma," an appellation which seems to be derived from the French word, "coustum" or "coutum," which signifies toll or tribute, not "consuetudines," which is the language of the law, whenever it means customs, usages. Customs, as increasing the prices of commodities in an immoderate degree, creating the offence of smuggling, and requiring great expenditure in their collection, are among the most impolitic and unstatesman-like means of raising a public revenue.

C[illegible]OUSE, an office in a maritime city or port-town, for the receipt of customs.

CUTICLE, a thin membrane closely lying upon the skin or cutis, of which it seems a part, and to which it adheres very firmly.

CUTIS is that strong covering which [illegible]elopes the whole external surface of [illegible]. The cutis is a peculiar modification of gelatine enabled to resist the action of water; and readily converted into glue.

CUTLERY. Though cutlery in the [illegible]se comprises all those arti[illegible]ated edge tools, it is more [illegible]ularly confined to the manufacture [illegible]ves, forks, scissars, pen-knives, [illegible] and swords. Damascus was anciently famed for its razors, sabres, and swords. The latter are said to possess all the advantages of flexibility, elasticity, and hardness. All those articles of cutlery which do not require a fine polish, and are of low price, are made from blistered steel. Those articles which require the edge to possess great tenacity, at the same time that superior hardness is not required, are made from sheer-steel. The finer kinds of cutlery are made from steel which has been in a state of fusion, and which is termed cast-steel, no other kinds being susceptible of a fine polish. Table-knives are mostly made of sheer-steel, the tang and shoulder, or bolster, being of iron, the blade part being attached by giving them a welding heat. The knives after forging are hardened by heating them red hot, and plunging them into water; they are afterwards heated over the fire till they become blue, and then ground. The handles of table-knives are made of ivory, horn, [illegible], stag horn, and wood, into which the blades are cemented with resin and pulverised brick. Forks are made almost altogether, by the aid of the stamp and appropriate dies. The prongs only are hardened and tempered. Razors are made of cast steel, the edge of a razor requiring the combined advantages of great hardness and tenacity. After the razor blade is forged, it is hardened by gradually heating it to a bright red heat, and plunging it into cold water. It is tempered by heating it afterwards till a brightened part appears of a straw colour. It would be more equally effected by sand, or what is still better, in hot oil, or fusible mixture consisting of eight parts of bismuth, five of lead and three of tin; a thermometer being placed in the liquid at the time the razors are immersed for the purpose of indicating the proper temperature, which is about 500 of Fahrenheit. After the razor has been ground into its proper shape, it is finished by glazing and polishing. The glazor is formed of wood, faced with an alloy of lead and tin; after its face is turned to the proper form and size, it is filled with notches, which are filled up with emery and tallow. This instrument gives to the razor a smooth and uniform surface, and consequently a fine edge. The polisher consists of a piece of circular wood running upon an axis, like that of the stone or the glazor. It is coated with leather, having from time to time its surface covered with crocus martis. The handles of high priced razors are made of ivory and tortoise shell, but in general they are of polished horn, which are preferred on account of their cheapness and durability. The horn is cut into pieces, and placed between two corresponding dies, having a recess of the shape of the handle. By this process the horn admits of considerable extension; if the horn is not previously black, the handles are dyed black by means of a bath of logwood and green vitriol. The clear horn handles are sometimes stained so as to imitate the tortoise-shell: this is effected by laying upon the handle a composition of three parts of potash, one of minium, ten of quick-lime, and as much water as will make the whole into a pulpy mass. Those parts of the handle requiring darker shades, are covered thicker than the other. After this substance is laid upon the handles, they are placed before the fire the time requisite for giving the proper effect.

The manufacture of pen-knives is divided into three departments; the first is the forging of the blades, the spring, and the iron scales; the second, the grinding and polishing of the blades,

and the third, the handling, which consists in fitting up all the parts, and finishing the knife. The blades are made of the best cast steel, and hardened and tempered to about the same degree with that of razors. In grinding they are made a little more concave on one side than the other; in other respects they are treated in a similar way to razors. The handles are covered with horn, ivory, and sometimes wood; but the most durable are those of stag-horn. The most general fault in pen-knives is that of being too soft. The temper ought to be not higher than a straw colour, as it seldom happens that a pen-knife is so hard as to snap on the edge.

The beauty and elegance of polished steel is not displayed to more advantage than in the manufacture of the finer kinds of scissars. The steel employed for the more valuable scissars should be cast steel of the choicest qualities; it must possess hardness and uniformity of texture for the sake of assuming a fine polish, great tenacity when hot for the purpose of forming the bow or ring of the scissar, which requires to be extended from a solid piece, having a hole previously punched through it. It ought also to be very tenacious when cold, to allow that delicacy of form observed in those scissars termed ladies' scissars. After the scissars are forged as near to the same size as the eye of the workmen can ascertain, they are paired. The bows and some other parts are filed to their intended form, the blades are also roughly ground, and the two sides properly adjusted to each other after being bound together with wire and hardened up to the bows. They are afterwards heated till they become of a purple colour, which indicates their proper temper. Almost all the remaining part of the work is performed at the grinding mill, with the stone, the lap, the polisher, and the brush. It is used to polish those parts which have been filed, and which the lap and the polisher cannot touch. Previously to screwing the scissars together for the last time, they are rubbed over with the powder of quick-lime, and afterwards wiped clean with a skin of soft sheep-leather. The quick-lime absorbs the moisture from the surface, to which the rusting of steel is justly attributed. Scissars are frequently beautifully ornamented by blueing and gilding, and also with studs of gold or polished steel. The very large scissars are partly of iron and partly of steel, the shanks and bows being of the former. These, as well as those all of steel which are not hardened all over, cannot be polished: an inferior sort of lustre, however, is given to them by means of a burnish of hardened polished steel, which is very easily distinguished from the real polish by the irregularity of the surface. See REES's NEW CYCLOPÆDIA.

CUTTING, or engraving on wood, an art carried to a great pitch three hundred years ago, and now revived and practised in great perfection. In many subjects, the engraving on wood has a richness which cannot be procured on copper. Of modern books that have been decorated with specimens of this art, the *British birds*, some of the designs in the *Fabliaux*, and Mr. BULMER's edition of *Somerville's Chase* will, perhaps, afford examples no where surpassed. Cutting on wood is also practised for many coarser purposes; as in printing calicoes and paper-hangings. The best wood for the blocks is that of box, as being of the finest grain, and the least liable to warp, or be worm-eaten. In this kind of engraving, no part, it must be obvious, can be executed. The other peculiarity is, [illegible] that which is to print white is cut away, while, in copper engraving, the white is left untouched. Hence, it may often be observed, that in fine wood-engravings, beautiful lights present themselves, which, there, are among the smallest part of the artist's merit, while, in copper, the same would be admirable, if not impracticable. Ugo da Carpi, an Italian painter of no very considerable talents, was the inventor of that species of engraving on wood distinguished by the name of *chiaro-oscuro* in imitation of drawing. This is performed by using more blocks than one; and Carpi commonly had three: the first the outline and dark shadows; the second for the lighter shadows: and the third for the half-tint. In this manner he produced prints after several designs and cartoons of Raphael; particularly one of the [illegible] descent from the cross; and the history of Simon, the sorcerer. He died in 1500. This art was brought to a great height by Balthazar Peruzzi, of Sienna, and by Permigiano, who published several excellent pieces.

CUTTINGS, or slips in gardening, are those branches or sprigs of trees, which are cut or slipped off, in order to be transplanted; an operation that may be effected in any moist fin[illegible]

earth. The most proper seasons for this purpose are the months of September, October, March, and April; but great care ought to be taken that the sap be not too abundant in the top, lest the *cut* decay, before that part which is in the ground, has taken sufficient root to support it; nor should it be too dry or scanty, as the sap in the branches promotes the growth of the root, especially if it be not planted too deep. See TRANSPLANTATION.

In selecting the cuttings, those branches which have joints, knots, or burrs, ought to be cut off two or three inches below the latter, and the leaves stripped so far as they are set in the earth. Small top-branches, of two or three years growth, are the most proper for this purpose.

CUTTLE-FISH, or *Sepia*, L. a remarkable genus of the finny tribe: the bones of a particular species, called the Officinal Cuttle, are frequently thrown on the sea on the British shore, but the fish itself very rarely.

This curious fish, when frightened or pursued, emits a black liquor, which is supposed to have been used by the ancients, instead of writing ink. It was also esteemed by them as a delicacy, but at present is relished only by the Italians. Its porous and laminated bones were formerly employed in medicine as an absorbent; and are still kept in the druggist shops. They are hard on one side, but soft and yielding on the other, so that very neat impressions from medals, &c. may be easily made upon them, and then serve as moulds for casting metallic figures representing the original. These bones, in a calcined state, are further useful, not only for cleaning and polishing silver, but chiefly for absorbing the acidity and tartness of wines, which, if not completely spoiled, may thus be restored to their former briskness.

CYDER, or CIDER, a sharp, cool, and vinous beverage, made by fermenting the juice of apples. Some connoisseurs in this liquor are of opinion, that the juice of the more delicate table-fruit is generally more cordial and pleasant than that of the wild or harsh kinds; though others assert the latter to be in many respects preferable.

The apples should remain on the tree till they are thoroughly ripe, when they ought to be gathered with the hand in dry weather, that they may be protected both from bruises and from moisture. They are then to be sorted, according to their various degrees of maturity, and laid in separate heaps in order to *sweat*; in consequence of which they greatly improve. This practice, however, appears to be useful only for such fruit as is not perfectly ripe, though some recommend it as being proper for *all* apples. The duration of the time of sweating may be determined by the flavour of the fruit, as different kinds require various lengths of time, namely, from eight or ten days to six weeks. The harsher and more crude the apples are, the longer it is necessary that they should remain in a sweating state, and not only be well dried, but the rotten parts carefully pared, before they are exposed.

The utility of the sweating practice is acknowledged in all the cyder countries, though various methods have been adopted in following it; as the apples are piled up either in the open air, or under cover in houses. In the South-hams, a middle way has been adopted, to avoid the fermentation occasioned by piling them up in rooms, and which we recommend as the best, and most rational. Heaps of fruit are raised in an open part of the orchard, where by means of a free air and less heat, the desired maturity is gradually effected, with an inconsiderable waste of the juice and decay of the fruit, which thus becomes almost totally divested of rancidity. And though a few apples will rot even in this manner, they are still fit for use: all of them continue plump and full of juice, and heighten, in a considerable degree, the colour of the liquor, without imparting to it any disagreeable smell or taste.

The fruit is then to be ground till the rind and kernels are well bruised; a process which will considerably improve the flavour and strength of the liquor, when it should be allowed to stand for a day or two, in a large open vessel. It is next pressed between several hair-cloths, and the liquor received in a vat, whence it is removed into casks, which ought to be placed in a cool situation, or in the free air, with their bung-holes open. These casks are to be sedulously watched, till the cyder *drops fine*, when it is to be immediately *racked off*, from the lees into other vessels. The first *racking* is a most important operation; as cyder, which is suffered to become foul again, by missing the first opportunity of racking it when fine, will never become what is called a *prime* liquor. After the clear part has been racked off, a-

quantity of lees or dregs remains, which, when filtered through coarse linen bags, yields a bright, strong, but extremely flat liquid: if this be added to the former portion, it will greatly contribute to prevent fermentation, an excess of which will make the cyder thin and acid. To avoid such an accident, the casks should neither be entirely filled, nor stopped down too close: and if the whole incline to ferment, it ought again to be racked. This latter operation, however, should on no account be repeated, unless from absolute necessity; as every *racking* diminishes its strength.

When there are no signs of any farther fermentation, the casks should be filled up with cyder of the best quality, and the bung-hole firmly closed with resin. [A gallon of brandy to every 30 gallons is a great improvement. It may be fined like other wine, either with eggs or skimmed milk.—T. C.]

Those who are anxious to prepare good cyder, ought diligently to watch every change of the weather, however slight; as the least neglect, at such times, is often detrimental to many hogsheads. In summer, the danger is much greater than in winter. [Let it be turned into vinegar, for it is unfit to be drank.—T. C.]

It has already been said that apples thrive well in all the states of United America, except in the low lands of the maritime parts of Carolina and Georgia. In such a variety of soils and climates, apples of great diversity of taste and flavour must necessarily grow. The cyder made from these apples accordingly differs very much; but in a general way it may be safely asserted, that the cyder of the United States equals that of any part of the world.

There have been numerous recipes published to make cyder, some of which have occasioned considerable losses. A few general and important rules will be given, for insuring good cyder, and afterwards some particular directions founded on experience.

1. The first and indispensible requisite for making good cyder is to choose perfectly ripe and sound fruit. Farmers, in general, are very inattentive to these points, but it is utterly impossible to make good cyder unless they be attended to.

2. The apples ought to be hand-picked, or caught in a sheet when the tree is shook. When they fall on the ground they become bruised, and as it frequently happens that they remain for some hours before pressing, the apples are apt to communicate a bad taste to the liquor from the bruised part.

3. After having sweated, and before being ground, the apples should be wiped, in order to remove a clammy moisture which covers them, and which, if permitted to remain would impoverish the cyder.

4. The practice above noted to press the pumice in hair cloths is certainly much preferable to the common American custom of inclosing it in bands of straw, because the straw, when heated in the mow or stack, gives the cyder a bad taste.

5. After cyder has run from the press, it has been directed to strain it through hair sieves into a large open vat, which will contain a whole making, or as much as can be pressed in one day. When the cyder has remained in this vat a day, or sometimes [illegible], according to the ripeness of the [illegible] which it has been made, and the state of the weather, the pumice, or grosser parts of the pulp, will rise to the top, and in a few hours, or after a day or two at furthest, will grow very thick, and when little white bubbles [illegible] through it, draw it off through a cock or faucet hole, within three inches from the bottom, that the lees may quietly remain behind. This operation is of great importance, as the sinking of the feculent matter would greatly injure the liquor.

6. On drawing off the cyder from the vat, it must be tunned into clean casks, and closely watched to prevent the fermentation; when therefore white bubbles, as mentioned above, are perceived at the bung hole, rack it again, immediately after which it will probably not ferment until March, when it must be racked off as before, and if possible in clear weather.

7. It is of great consequence to prevent the escape of the *carbonic acid*, or fixed air, from cyder, as on this principle all its briskness depends. To effect this, various expedients have been contrived. In the state of Connecticut, where much cyder is made, it is a common practice to pour a tumbler of olive oil in the bung-hole of every cask. Upon the same principle we have lately heard of a man, who boasted that he had drank brisk beer out of the same cask, for *five* years, and that his secret was to cover the surface of the liquor with olive oil. Dr. DARWIN also says he was told by a gentleman who ma[illegible]

considerable quantity of cyder on his estate, that he procured vessels of stronger construction than usual, and that he directed the apple juice, as soon as it had settled, to be bunged up close, and that though he had had one vessel or two occasionally burst by the expansion of the fermenting liquor, yet that this rarely occurred, and that his cyder never failed to be of the most excellent quality, and was sold at a great price. *Orris root,* in powder, gives a pleasant flavour to cyder.

A friend directs cyder to be bottled in July, to fill the bottles within two inches of the top, letting them stand twelve hours open before corking. Use strong porter bottles, and the best velvet corks. The bottling should be done in clear weather.

Cyder is a cooling, pleasant, and wholesome liquor during the heat of summer, if it has been prepared without foreign ingredients, and properly fermented. On the contrary, when it is too [illegible] tart, or has perhaps been kept in leaden vessels; or the apples and pears have, after grinding them, passed through leaden tubes, we can by no means recommend it as a salubrious beverage; because that poisonous [illegible] is easily dissolved by the [illegible] thus gradually introduced into the body. However agreeably such cyder, or perry, may stimulate the palate, it cannot fail, sooner or later, to produce painful and dangerous colics, as it not unfrequently generates the most desperate and incurable obstipations, among those who accustom themselves to the free use of these liquors.

Cyder-Spirit, (apple whiskey) an ardent liquor drawn from cyder by distillation in the same manner as brandy from wine. The flavour peculiar to this spirit is agreeable; but it is very wholesome [illegible]

Cyder-Wine is a liquor made by boiling the fresh juice of apples: after being kept three or four years it is said to acquire the flavour and colour of Rhenish wine. The method of preparing it consists in evaporating the juice in a brewing copper, till one half be dissipated; the remainder is then immediately conveyed to a wooden cooler, whence it is barrelled, with the addition of a due proportion of yeast, and fermented in the usual manner, [and is then a very coarse and inelegant beverage. [illegible] C].

CYLINDER in geometry, a solid body, supposed to be generated by the [illegible] of a parallelogram. If the generating parallelogram be rectangular, the cylinder it produces will be a right cylinder, that is, it will have its axis perpendicular to its base. If the parallelogram be a rhombus, or rhomboides, the cylinder will be oblique or scalenous.

Cylinder, properties of the, 1. The section of every cylinder by a plain oblique to its base, is an ellipsis. 2. The superfices of a right cylinder is equal to the periphery of the base multiplied into the length of its side. 3 The solidity of a cylinder is equal to the area of its base, multiplied into its altitude. 4. Cylinders of the same base, and standing between the same parallels are equal. 5. Every cylinder is to a sphere'd inscribed in it, as 3 to 2. 6. If the altitudes of two right cylinders be equal to the diameters of their bases, those cylinders are to one another as the cubes of the diameters of their bases.

CYNIPS, the gall fly, a genus of insects of which there are 35 species, chiefly found in the oak. The most beautiful gall is the production of the cynips quercus gemmæ, who piercing the terminal bud of the tree deposits its egg in the interior, and hereby, with the hatching and progressive growth of the larva converts it from a healthy bud into a fine dark green gall, leafed like a rose-bud beginning to blow, about an inch in diameter, and held to the branch by a pedicle.

CYPHER denotes certain secret characters disguised and varied; used in writing letters that contain some secret, not to be understood or discovered but by those between whom the cypher is agreed on. Writing in cypher is chiefly practised in diplomatic correspondence, or in affairs that relate to war, &c It should possess these three properties: the characters should be easily written and read, they should be very difficult of being found out, and they should be clear of suspicion. See Rees's New Cyclopedia, in which, under the word Cipher, the whole art is exhibited. See Diplomatic Letters.

CYPRÆA, or cowry, a shell which contains an animal of the slug kind. Cowries are found in the Persian Gulph and Indian Ocean, and some in the Mediterranean, and other seas. In many parts they are used as money in the way of commerce.

CYPRESS, the Common, or *Cupressus sempervirens,* L. is a native of the islands of Candia and Crete, but may be easily propagated in Britain, from seeds as

well as cuttings. The proper season for sowing the former, is the month of March, when the ground should be dug, well broken, raked smooth, and an inch of the earth drawn evenly off the surface into an alley: the seeds should then be scattered moderately thick, and the soil sifted immediately over them, half an inch deep. During the summer, they should be kept clear of weeds, and, in dry weather, gently watered: in winter they must be occasionally sheltered from the frost, with mats; and, in the course of two years, they will be fit for transplanting, when they should be set in nursery rows, two feet asunder; and, in three or four years, they may be removed to the shrubbery.

The cypress-tree, though found in most of our old gardens, is at present much neglected: it deserves, however, to be more diligently cultivated, as it not only adds considerable beauty to wildernesses and groves, but also affords a valuable wood, which is aromatic, very compact, and heavy; is neither liable to decay or putrify, nor to the devastations of the worm, so that it is admirably calculated for chests, drawers, musical instruments, and other utensils.

This tree is eminently recommended for purifying the air, and for the benefit of weak lungs: hence the ancient physicians sent their consumptive patients to the island of Crete, where the cypress is very abundant. Its nuts, or fruit, is a very powerful astringent, and balsamic, and is, perhaps, inferior to none of th[illegible] employed in diarrhœas and dysenteries.

Deciduous Cypress-tree, or *Cupressus disticha*, stands, according to Mr. Wm. Bartram, in the first order of American trees. It abounds in the southern states, where it measures from eight to twelve feet diameter, and from 40 to 50 feet straight shaft.

Shingles are made of the cypress-tree, and sell from 8 to 10 dollars per thousand: they are commonly 2 feet 9 inches long for home consumption, but for the West-India market, those of 18 inches in length are preferred. The cypress is growing in the late Mr. Bartram's garden on the Schuylkill.

Cypress shingles are equally durable as those made of white cedar, but the nature of the wood does not permit them to be cut of a greater breadth than about five and an half inches, and about the length above mentioned. If attempts be made to cut a wider shingle the wood splits.

In driving nails through cypress shingles, they are very apt to split, unless holes are first bored for nails: hence roofs covered with such shingles sometimes leak. Upon out-houses they answer as well as the cedar shingles.

For directions to shingle houses in the best manner, see House.

[So far Dr. Mease. It is high time that the dangerous practice of covering roofs with wooden shingles s[illegible] abolished altogether.—T. C.]

CYPRINUS, the carp, a genus of fishes of which the most remarkable species is the gold-fish, known here as an object of curiosity, but a native of China, where it is kept in vases of immense size and exquisite workmanship. It appears sensible of favours, capable of attachment, and is one of the most interesting objects of attention and care to the ladies of that country.

END OF VOL. I.